TECHNICAL SPECIFICATIONS

FOR

INTERIM EMERGENCY WELLHEAD TREATMENT
AQUA NEW YORK WATER TREATMENT FACILITY

SEAMANS NECK ROAD

NASSAU COUNTY, NEW YORK

FOR

NAVAL FACILITIES ENGINEERING COMMAND,

MID-ATLANTIC

PREPARED BY:

Tetra Tech NUS, Inc.

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CONTENTS

SECTION 01 01 00

SCOPE OF WORK

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall provide all services and materials necessary for the installation of the **"Installation Of Interim Emergency GAC Units at Aqua New York Seamans Neck Road Water Plant"**, located at **670 Seaman's Neck Road, Levittown, NY 11783** as shown on the Technical Drawings.

B. A Scope of Work is provided as **Attachment A of this Section**, and is provided to create a uniform Schedule of Values and Measurement of Payment. The Scope is broken down into the following structure:

Part A: General Scope of Work

Section 1: Mobilization and Demobilization
Section 2: Site Work
Section 3: Process Treatment Systems
Section 4: Restoration

C. The work shall be complete and includes furnishing, as applicable or required, all Contractor's safety devices, labor, tool, materials, supplies, and services; and performing all operations necessary for or incidental to a complete project in conformance with the attached Technical Drawings and Specifications.

D. The Contractor shall furnish all labor, materials, equipment and incidentals to install the above listed systems and equipment, including the piping and instrumentation between all specified components and auxiliary equipment.

E. Contractor shall be responsible for the installation of all equipment, valves, piping and any required installation.

F. Contractor will provide one (1) year warranty for parts and workmanship, or as specified in the individual part warranties, whichever is greater.

1.2 REFERENCE SPECIFICATIONS

This section refers to all technical specification divisions.

1.3 SUBMITTALS

The Contractor shall submit the following to the Contracting Officer for review, comment, and approval prior to pre-construction conference.

A. Contractor's markup drawings.

B. Product information for any proposed additions or changes per the Contractors markup drawings showing all important details, layout of components, materials of construction and dimensions.

1.4 OPERATING INSTRUCTIONS

A. Operations and Maintenance is not part of the Contractor's Scope of Work. Updating the O&M manual is also not part of the Contractor's Scope of Work. The Contractor shall turn over the manufacturer's operating and maintenance instructions that typically accompany equipment to the Contracting Officer.

1.5 TOOLS, SPARE PARTS, AND CONSUMABLES

All special tools, spare parts, and consumables required for normal operation and maintenance shall be furnished in accordance with individual specifications.

1.6 EQUAL PRODUCTS

The Technical Drawings and Technical Specifications are based on a conceptual arrangement of equipment and piping. Should the Contractor propose to furnish equal equipment of a different configuration, the Contractor shall be responsible for all additions and modifications, as approved by the Contracting Officer, necessary to incorporate the proposed equipment into the design and submit all of the affected and revised Technical Drawings and Technical Specifications for review and approval by the Contracting Officer prior to their implementation.

PART 2 – PRODUCTS

The Contractor shall ensure that the individual components, piping, valves, and instrumentation interfaces are strategically located such that the complete interim emergency groundwater treatment system incorporates straight runs of minimum distance, to the extent possible. In addition, the Contractor shall ensure that the components and auxiliary equipment fit within the allotted space shown on the Technical Drawings. The Contractor placement of individual units shall allow for adequate access to components within each unit, including instrumentation and valves, to allow for easy maintenance or replacement as may be required.

PART 3 – EXECUTION

3.1 DELIVERY AND STORAGE OF EQUIPMENT

A. No shipment shall be made until shop drawings have been submitted to and approved in writing by the Contracting Officer.

B. All units shall be preassembled to the largest extent possible, compatible with transportation limitations and equipment protection considerations. Units shall be shipped complete, to the extent possible. Where absolutely necessary, some piping may be match-marked and broken down in a minimum number of pieces for field assembly by the Contractor. Pressure gauges, local instruments and primary elements, etc., may be removed for protective shipment and shall be installed in field by the Contractor.

C. Piping or other fittings shall not be used for lifting.

3.2 INSTALLATION

Installation of units and auxiliary equipment shall be in accordance with the Suppliers and/or Manufacturers' instructions and recommendations, and as shown on the Technical Drawings and approved Contractor markups.

3.3 INTEGRITY INSPECTION AND FIELD TESTING

A. The Contractor shall perform integrity testing of the new systems, shall be present for initial startup, and shall be present when the new systems are taken on-line with the existing system.

B. Field inspections and tests may be conducted periodically by the Contractor during installation. Integrity inspection and field testing shall be performed by the Contractor when the installations of the entire systems are complete and ready for testing.

C. The Contractor shall hydrostatically test the entire treatment/process system by filling it with potable water.

D. After testing, the treatment system shall be taken on-line with the existing system by the Contracting Officer, with the Contractor present at system startup.

E. Should any part of the temporary GAC systems fail to perform in accordance with these specifications, the Contractor shall, at his own expense, make such modifications as necessary to provide satisfactory performance of the new system. If retest still fails to demonstrate conformance with the specifications, the Contracting Officer may elect to require a replacement, a modification, a cost deduction, or a combination of the above.

SECTION 01 01 00

ATTACHMENT "A" – SCOPE OF WORK

PART A – GENERAL SCOPE OF WORK

Section 1: Mobilization and Demobilization

Mobilization and Demobilization consists of the following construction components:

1. Provide, Execute, and Close-out the Contractor Work Plan
2. Execute the Health and Safety Plan including quality control, spill control, health and safety, traffic control, and site security.
3. Provide permits, bonds, warranties, fees, insurance, and other similar expenses required by the contract.
4. Mobilization and Demobilization of all equipment, tools, materials, supplies, temporary facilities and utilities, and personnel required to perform the work.
5. Compliance with all regulatory requirements.
6. Pre-construction and construction period planning, management, scheduling, submittals, reporting, project closeout, administration and documentation.
7. Close out the project per the Contractor Work Plan and Health and Safety Plan
8. All other requirements and miscellaneous items not included in other pay items.

Section 2: Site Preparation

Site Preparation and Temporary Facilities consist of the following construction components:

1. Stake-out limits of construction locations and other important features such as water main centerlines, and temporary concrete pad corners.
2. Post safety signs, temporary security fencing, tree protection fencing, flagging, and other access restrictions.
3. Coordinate temporary and relocated utilities to keep the existing treatment plant functional, and remove/cap utilities as needed to perform the Contract.
4. Clear the temporary pad area as shown on the Technical Drawings.
5. Install concrete pad (slab on grade) as shown in the technical drawings. The concrete pad will be 10-inch thick. The slab on grade shall be provided with #6 bars at 8-inch on center each way at the bottom of the slab and #6 bar at 16-inch on center each way at the top of the slab. The rebar yield strength yield strength (Fy) shall be 60 ksi. See additional details below:

Location	f'c (Min. 28-Day Comp. Strength) (psi)	ASTM C 33/C 33M Maximum Nominal Aggregate (Size No.)	Range of Slump (inches)	Maximum Water-Cement Ratio (by weight)	Air Entr. (percent)
Concrete Exposed to Weather	4500	57	4+/- 1	0.50	6

6. Unload and install activated carbon units, piping, and accessories prior to making connection to the existing system.

7. Prepare a stable base and install the temporary used backwash tank (20,000 gallon) for draining the tanks.

8. Perform trenching for installation of piping and valves as shown in the technical drawings. Coordination will also be required with Aqua NY for water main tie-in.

Section 3: Process, Treatment, and Instrumentation Systems

Process, Treatment, and Instrumentation Systems consists of the following components:

1. Furnish a liquid-phase granular activated carbon system (LPGAC) as shown in the technical drawings and as described in the design report and technical specifications

2. Furnish all piping, valves, monitoring equipment (flow and pressure), and appurtenances (pipe supports, etc) for the interim emergency LPGAC systems to function.

3. Install 20,000 gallons temporary storage tank for collection of used backwash water.

4. Conduct startup, testing, and if required conduct LPGAC backwashing.

Section 4: Site Work and Restoration

The Site Work and Restoration consist of the following components:

1. Disposal of used activated carbon shall be coordinated with the contracting officer.

2. Coordinate taking the temporary GAC units off-line with Aqua NY.

3. Dismantle and remove activated carbon unites. Demolish and remove temporary equipment pad.

4. Furnish all topsoil and seeding.

5. Repair or replace asphalt, concrete (including curb), fence, grass, trees, decorative planting, or other permanent site features that were disrupted during construction to visual acceptance or otherwise working condition.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
11/10

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(2005; R 2009) Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats
AASHTO M 322M/M 322	(2010) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI/MCP-1	(2011) Manual of Concrete Practice Part 1
ACI/MCP-2	(2011) Manual of Concrete Practice Part 2
ACI/MCP-3	(2011) Manual of Concrete Practice Part 3
ACI/MCP-4	(2011) Manual of Concrete Practice Part 4

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

ASTM INTERNATIONAL (ASTM)

ASTM A615/A615M	(2009b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A82/A82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM C 1017/C 1017M	(2007) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1107/C 1107M	(2011) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C 1116/C 1116M	(2010a) Standard Specification for Fiber-Reinforced Concrete

ASTM C 143/C 143M	(2010) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C 150/C 150M	(2011) Standard Specification for Portland Cement
ASTM C 156	(2009a) Standard Test Method for Water Retention by Concrete Curing Materials
ASTM C 171	(2007) Standard Specification for Sheet Materials for Curing Concrete
ASTM C 173/C 173M	(2010b) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192/C 192M	(2007) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 295	(2008) Petrographic Examination of Aggregates for Concrete
ASTM C 309	(2007) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 31/C 31M	(2010) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C 311	(2011) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
ASTM C 33/C 33M	(2011) Standard Specification for Concrete Aggregates
ASTM C 39/C 39M	(2010) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(2010a) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 494/C 494M	(2010a) Standard Specification for Chemical Admixtures for Concrete
ASTM C 618	(2008a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C 920	(2011) Standard Specification for Elastomeric Joint Sealants
ASTM C 94/C 94M	(2011) Standard Specification for Ready-Mixed Concrete

ASTM C 989	(2010) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C172/C172M	(2010) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231/C231M	(2010) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C233/C233M	(2010a) Standard Test Method for Air-Entraining Admixtures for Concrete
ASTM C260/C260M	(2010a) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 1751	(2004; R 2008) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(2004a; R 2008) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D 5759	(1995; R 2005) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D 6690	(2007) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E 1745	(2009) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
ASTM E 329	(2011) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2009; 28th Ed) Manual of Standard Practice

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2007) DOC Voluntary Product Standard PS 1-07, Structural Plywood

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS1 (1995) Construction and Industrial Plywood with Typical APA Trademarks

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings for concrete formwork must be submitted by the Contractor in accordance with paragraph entitled, "Shop Drawings," of this section, to include the following:

Reinforcing steel; G

Reproductions of contract drawings are unacceptable.

Provide erection drawings for concrete that show placement of reinforcement and accessories, with reference to the contract drawings.

SD-03 Product Data

Materials for curing concrete
Joint sealants

Submit manufacturer's product data, indicating VOC content. Manufacturer's catalog data for the following items must include printed instructions for admixtures, bonding agents, epoxy-resin adhesive binders, waterstops, and liquid chemical floor hardeners.]

Joint filler

Cement
Portland Cement
Ready-Mix Concrete
Vapor barrier

Concrete Curing Materials
Reinforcement
Reinforcement Materials

Synthetic reinforcing fibers

SD-05 Design Data

Concrete mix design; G

Thirty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, , ground slag polypropylene fibers, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submit copies of the fly ash, , polypropylene fibers and pozzolan test results, in addition. The approval of fly ash, , and pozzolan , and polypropylene fibers test results must be within 6 months of submittal date. Obtain acknowledgement of receipt prior to concrete placement.

SD-06 Test Reports

Concrete mix design; G

Fly ash

Pozzolan

Ground granulated blast-furnace slag

Aggregates

Fiber-reinforced concrete

Compressive strength tests

Air Content

Slump

Submit mill certificates for Steel Bar according to the paragraph entitled, "Fabrication," of this section.

Provide certificates for concrete that are in accordance with the paragraph entitled, "Classification and Quality of Concrete," of this section. Provide certificates that contain project name and number, date, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer, brand name of manufactured materials, material name, values as specified for each material, and test results. Provide certificates for Welder Qualifications that are in accordance with the paragraph entitled, "Qualifications for Welding Work," of this section.

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver concrete until vapor retarder, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. ACI/MCP-2 for job site storage of materials. Protect materials from contaminants such as grease, oil, and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Drawings

1.6.1.1 Reinforcing Steel

ACI/MCP-4. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.

1.6.2 Control Submittals

1.6.2.1 Curing Concrete Elements

Submit proposed materials and methods for curing concrete elements.

1.6.2.2 Material Safety Data Sheets

Submit Material Safety Data Sheets (MSDS) for all materials that are regulated for hazardous health effects. Prominently post the MSDS at the construction site.

1.6.3 Test Reports

1.6.3.1 Concrete Mix Design

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix must be suitable for the job conditions. Include mill test and all other test for cement, aggregates, and admixtures in the laboratory test reports. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Submit test reports along with the concrete mix design. Obtain approval before concrete placement.

1.6.3.2 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C 618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date. Submit manufacturer's policy statement on fly ash use in concrete.

1.6.3.3 Ground Granulated Blast-Furnace Slag

Submit test results in accordance with ASTM C 989 for ground granulated blast-furnace slag. Submit test results performed within 6 months of submittal date. Submit manufacturer's policy statement on slag use in concrete.

1.7 QUALIFICATIONS FOR CONCRETE TESTING SERVICE

Perform concrete testing by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency must meet the requirements of ASTM E 329.

1.8 CONCRETE SAMPLING AND TESTING

Testing by the Contractor must include sampling and testing concrete materials proposed for use in the work and testing the design mix for each class of concrete. Perform quality control testing during construction.

Sample and test concrete aggregate materials proposed for use in the work in accordance with ASTM C 33/C 33M.

Sample and test portland cement in accordance with ASTM C 150/C 150M.

Sample and test air-entraining admixtures in accordance with ASTM C233/C233M.

Testing must be performed by a Grade I Testing Technician.

PART 2 PRODUCTS

2.1 MATERIALS FOR FORMS

Provide wood, plywood, plastic, carton, or steel. Use plywood or steel forms where a smooth form finish is required.

2.1.1 Wood Forms

Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with DOC/NIST PS1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.2 CONCRETE

2.2.1 Contractor-Furnished Mix Design

ACI/MCP-1, ACI/MCP-2, and ACI/MCP-3 except as otherwise specified. Indicate the compressive strength (f'c) of the concrete for each portion of the structure(s) and as specified below.

Location	f'c (Min. 28-Day Comp. Strength) (psi)	ASTM C 33/C 33M Maximum Nominal Aggregate (Size No.)	Range of Slump (inches)	Maximum Water-Cement Ratio (by weight)	Air Entr. (percent)
All areas	4,500	1 1/2"	4 +/-1	0.45	6 +/-1.5

Maximum slump shown above may be increased 1 inch for methods of consolidation other than vibration. Slump may be increased to 8 inches when superplasticizers are used. Provide air entrainment using air-entraining admixture. Provide air entrainment within plus or minus 1.5 percent of the value specified.

2.2.1.1 Mix Proportions for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified are the responsibility of the Contractor. Base mixture proportions on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M. Samples of all materials used in mixture proportioning studies must be representative of those proposed for use in the project and must be accompanied by the manufacturer's or producer's test report indicating compliance with these specifications. Base trial mixtures having proportions, consistencies, and air content suitable for the work on methodology described in ACI/MCP-1. In the trial mixture, use at least three different water-cement ratios for each type of mixture, which must produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratio required must be based on equivalent water-cement ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan, and ground granulated blast-furnace slag by

weight equivalency method. Design laboratory trial mixture for maximum permitted slump and air content. Each combination of material proposed for use must have separate trial mixture, except for accelerator or retarder use can be provided without separate trial mixture. Report the temperature of concrete in each trial batch. For each water-cement ratio, at least three test cylinders for each test age must be made and cured in accordance with ASTM C 192/C 192M and tested in accordance with ASTM C 39/C 39M for 7 and 28 days. From these results, plot a curve showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, plot a curve showing the relationship between 7 and 28 day strengths.

2.2.1.2 Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI/MCP-2. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI/MCP-2. When a concrete production facility does not have a suitable record of tests to establish a standard deviation, the required average strength must follow ACI/MCP-2 requirements.

2.2.2 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C 94/C 94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C 94/C 94M:

Type and brand cement

Cement content in 95-pound bags per cubic yard of concrete

Maximum size of aggregate

Amount and brand name of admixtures

Total water content expressed by water/cement ratio

2.2.3 Concrete Curing Materials

2.2.3.1 Absorptive Cover

Provide burlap cloth cover for curing concrete made from jute or kenaf, weighing 10 ounces plus or minus 5 percent per square yard when clean and dry, conforming to ASTM C 171, Class 3; or cover may be cotton mats as approved.

2.2.3.2 Moisture-Retaining Cover

Provide waterproof paper cover for curing concrete conforming to ASTM C 171, regular or white, or polyethylene sheeting conforming to ASTM C 171, or polyethylene-coated burlap consisting of a laminate of burlap and a white opaque polyethylene film permanently bonded to the burlap; burlap must

conform to ASTM C 171, Class 3, and polyethylene film must conform to ASTM C 171. When tested for water retention in accordance with ASTM C 156, weight of water lost 72 hours after application of moisture retaining covering material must not exceed 0.039 gram per square centimeter of the mortar specimen surface.

2.2.3.3 Membrane-Forming Curing Compound

Provide liquid type compound conforming to ASTM C 309, Type 1, clear, Type 1D with fugitive dye for interior work and Type 2, white, pigmented for exterior work.

2.3 MATERIALS

2.3.1 Cement

ASTM C 150/C 150M, Type I or II blended cement except as modified herein. Provide blended cement that consists of a mixture of ASTM C 150/C 150M, Type II, cement and one of the following materials: ASTM C 618 pozzolan or fly ash, ASTM C 989 ground granulated blast-furnace slag. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.

2.3.1.1 Fly Ash and Pozzolan

ASTM C 618, Type N, F, or C, except that the maximum allowable loss on ignition must be 6 percent for Types N and F. Add with cement. If used, Fly ash content must be a minimum of 40 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permittable that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C 311. Evaluate and classify fly ash in accordance with ASTM D 5759.

High contents of supplementary cementitious materials can have some detrimental effects on the concrete properties, such as slowing excessively the strength gain rate, and delaying and increasing the difficulty of finishing. The recommended maximum content (by weight of the total cementitious material) for these materials are:

1. For GGBF slag: 50 percent

2. For fly ash or natural pozzolan: 40 percent (25 percent in cold climates)

2.3.1.2 Ground Granulated Blast-Furnace Slag

ASTM C 989, Grade 100 or 120. Slag content must be a minimum of 50 percent by weight of cementitious material.

2.3.1.3 Portland Cement

Provide cement that conforms to ASTM C 150/C 150M, Type I . Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

2.3.2 Water

Minimize the amount of water in the mix. The amount of water must not exceed 45 percent by weight of cementitious materials (cement plus pozzolans), and in general, improve workability by adjusting the grading rather than by adding water. Water must be fresh, clean, and potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

2.3.3 Aggregates

ASTM C 33/C 33M, except as modified herein. Furnish aggregates for exposed concrete surfaces from one source. Provide aggregates that do not contain any substance which may be deleteriously reactive with the alkalies in the cement.

Aggregates must not possess properties or constituents that are known to have specific unfavorable effects in concrete when tested in accordance with ASTM C 295.

2.3.3.1 Aggregates/Combined Aggregate Gradation (Floor Slabs Only)

ASTM C 33/C 33M, uniformly graded and as follows: Nominal maximum aggregate size of 1 inch. A combined sieve analysis must indicate a well graded aggregate from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 (0.3mm) sieve, and less than 8 percent may be retained on sieves finer than No. 50 (0.3mm). Provide sand that is at least 50 percent natural sand.

2.3.4 Nonshrink Grout

ASTM C 1107/C 1107M.

2.3.5 Admixtures

ASTM C 494/C 494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures.

2.3.5.1 Air-Entraining

ASTM C260/C260M.

2.3.5.2 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C 494/C 494M, Type F and Type G (HRWR retarding admixture) and ASTM C 1017/C 1017M.

2.3.5.3 Pozzolan

Provide fly ash or other pozzolans used as admixtures that conform to ASTM C 618.

2.3.6 Vapor Barrier

ASTM E 1745 polyethylene sheeting, minimum 10 mil thickness.

2.3.7 Materials for Curing Concrete

Use water-based curing compounds, sealers, and coatings with low (maximum 160 grams/liter, less water and less exempt compounds) VOC content.

2.3.7.1 Impervious Sheeting

ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.

2.3.7.2 Pervious Sheeting

AASHTO M 182.

2.3.7.3 Liquid Membrane-Forming Compound

ASTM C 309, white-pigmented, Type 2, Class B.

2.3.8 Expansion/Contraction Joint Filler

ASTM D 1751, ASTM D 1752, cork or 100 percent post-consumer paper meeting ASTM D 1752 (subparagraphs 5.1 to 5.4). Material must be 1/2 inch thick, unless otherwise indicated.

2.3.8.1 Preformed Joint Filler Strips

Provide nonextruding and resilient bituminous type filler strips conforming to ASTM D 1751.

2.3.9 Joint Sealants

Use concrete penetrating sealers with a low (maximum 100 grams/liter, less water and less exempt compounds) VOC content.

2.3.9.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D 6690 or ASTM C 920, Type M, Class 25, Use T.

2.3.9.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C 920, Type M, Grade NS, Class 25, Use T.

2.4 REINFORCEMENT

2.4.1 Reinforcing Bars

ACI/MCP-2 unless otherwise specified. Use deformed steel. ASTM A615/A615M and AASHTO M 322M/M 322 with the bars marked A, S, W, Grade 60.

2.4.2 Wire

2.4.2.1 Steel Wire

Wire must conform to ASTM A82/A82M.

2.4.3 Reinforcing Bar Supports

Provide bar ties and supports of coated or non-corrodible material.

2.4.4 Fiber-Reinforced Concrete

In addition to the requirements specified above, provide fiber reinforced concrete in accordance with ASTM C 1116/C 1116M Type III, synthetic fiber reinforced concrete, and as follows. Synthetic reinforcing fibers must be 100 percent virgin monofilament polypropylene fibers, with a minimum of 10 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. Provide fibers that have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Use a minimum of 1.5 pounds of fibers per cubic yard of concrete. Add fibers at the batch plant.

2.4.5 Supports for Reinforcement

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire fabric in place.

Provide wire bar type supports conforming to ACI/MCP-3, ACI/MCP-4 and CRSI 10MSP.

2.5 CLASSIFICATION AND QUALITY OF CONCRETE

2.5.1 Concrete Classes and Usage

Provide concrete classes, compressive strength, requirements for air entrainment, and usage as follows:

CONCRETE CLASS	MIN. 28-DAY COMPRESSIVE STRENGTH POUNDS PER SQ. IN.	REQUIREMENT FOR AIR ENTRAINMENT	USAGE
4.5A	4,500	Air-entrained	For structural concrete work exposed to freezing and thawing, unless otherwise indicated or specified, such as exterior slabs on grade.
4N	4,000	Nonair-	For structural concrete

2.5.2 Limits for Concrete Proportions

Provide limits for maximum water/cement ratio and minimum cement content for each concrete class as follows:

CONCRETE CLASS	MAX. WATER/CEMENT RATIO BY WEIGHT	MIN. CEMENT FOR 3- TO 4-INCH SLUMP, (NO. OF 94-POUND SACKS) PER CU. YD.
4.5A	0.45	6.0

* Weight of water to weight of cement in pounds in one cubic yard of concrete

2.5.3 Maximum Size of Aggregate

Size of aggregate, designated by the sieve size on which maximum amount of retained coarse aggregate is 5 to 10 percent by weight, must be as follows:

MAXIMUM SIZE OF AGGREGATE	ASTM C 33/C 33M SIZE NUMBER	TYPE OF CONSTRUCTION
1-1/2 inches	467	Monolithic slabs on ground, concrete fill, and other flatwork having a depth of not less than 5 inches and a clear distance between reinforcing bars of not less than 2 inches

Maximum size of aggregate may be that required for most critical type of construction using that concrete class.

Specify gradation of aggregates for separate floor topping.

2.5.4 Slump

Provide slump for concrete at time and in location of placement as follows:

TYPE OF CONSTRUCTION	SLUMP
Monolithic slabs	Not less than 3 inch es nor more than 5 inches

2.5.5 Total Air Content

Air content of exposed concrete and interior concrete must be in accordance with ASTM C260/C260M and/or as follows:

LIMITS CONCRETE EXPOSURE	REQUIREMENT FOR AIR ENTRAINMENT	MAXIMUM SIZE OF AGGREGATE	TOTAL AIR CONTENT BY VOLUME
Exposed to freezing and thawing or subjected	Air-entrained	1-1/2	4.5 to 7.5 percent

to hydraulic
pressure

Provide concrete exposed to freezing and thawing or subjected to hydraulic pressure that is air-entrained by addition of approved air-entraining admixture to concrete mix.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before processing.

Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect/Engineer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Slabs on Ground

Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

Previously constructed subgrade or fill must be cleaned of foreign materials and inspected by the Contractor for adequate compaction and surface tolerances as specified.

Actual density of top 12 inches of subgrade soil material-in-place must not be less than the following percentages of maximum density of same soil material compacted at optimum moisture content in accordance with ASTM D 1557.

SOIL MATERIAL	PERCENT MAXIMUM DENSITY
Capillary water barrier	100
Cohesionless soil material	100
Cohesive soil material	95

Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

Prepare subgrade or fill surface under exterior slabs on ground as specified for subgrade under foundations and footings.

3.2.3 Formwork

Complete and approve formwork. Remove debris and foreign material from interior of forms before start of concrete placing.

3.2.4 Edge Forms and Screed Strips for Slabs

Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.5 Reinforcement and Other Embedded Items

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.3 FORMS

ACI/MCP-2. Provide forms and shoring for concrete placement. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris.

3.3.1 General

Construct forms to conform, within the tolerances specified, to shapes dimensions, lines, elevations, and positions of cast-in-place concrete members as indicated. Forms must be supported, braced, and maintained sufficiently rigid to prevent deformation under load.

3.3.2 Design and Construction of Formwork

Provide formwork design and construction that conforms to ACI/MCP-2, Chapter 4.

Provide forms that are tight to prevent leakage of cement paste during concrete placing.

Support form facing materials by structural members spaced close to prevent deflection of form facing material. Fit forms placed in successive units for continuous surfaces to accurate alignment to ensure a smooth completed surface within the tolerances specified. Where necessary to maintain the

tolerances specified, such as long spans where immediate supports are not possible, camber formwork for anticipated deflections in formwork due to weight and pressure of fresh concrete and to construction loads.

Chamfer exposed joints, edges, and external corners a minimum of 3/4 inch by moldings placed in corners of column, beam, and wall forms.

Provide shores and struts with a positive means of adjustment capable of taking up formwork settlement during concrete placing operations. Obtain adjustment with wedges or jacks or a combination thereof. When adequate foundations for shores and struts cannot be secured, provide trussed supports.

Provide forms that are readily removable without impact, shock, or damage to concrete.

3.3.3 Coating

Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.

3.3.4 Forms for Standard Rough Form Finish

Give rough form finish concrete formed surfaces that are to be concealed by other construction, unless otherwise specified.

Form facing material for standard rough form finish must be the specified concrete form plywood or other approved form facing material that produces concrete surfaces equivalent in smoothness and appearance to that produced by new concrete form plywood panels.

For concrete surfaces exposed only to the ground, undressed, square-edge, 1-inch nominal thickness lumber may be used. Provide horizontal joints that are level and vertical joints that are plumb.

3.3.5 Forms for Standard Smooth Form Finish

Give smooth form finish concrete formed surfaces that are to be exposed to view or that are to be covered with coating material applied directly to concrete or with covering material bonded to concrete, such as waterproofing, dampproofing, painting, or other similar coating system.

Form facing material for standard smooth finish must be the specified overlaid concrete form plywood or other approved form facing material that is nonreactive with concrete and that produce concrete surfaces equivalent in smoothness and appearance to that produced by new overlaid concrete form plywood panels.

Maximum deflection of form facing material between supports and maximum deflection of form supports such as studs and wales must not exceed 0.0025 times the span.

Provide arrangement of form facing sheets that are orderly and symmetrical, and sheets that are in sizes as large as practical.

Arrange panels to make a symmetrical pattern of joints. Horizontal and vertical joints must be solidly backed and butted tight to prevent leakage and fins.

3.3.6 Tolerances for Form Construction

Construct formwork to ensure that after removal of forms and prior to patching and finishing of formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI/MCP-1 and ACI/MCP-2.

3.3.7 Removal of Forms and Supports

After placing concrete, forms must remain in place for the time periods specified in ACI/MCP-4. Do not remove forms (except those used for slabs on grade and slip forms) until the client determines that the concrete has gained sufficient strength to support its weight and superimposed loads. Base such determination on compliance with one of the following:

a. The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed, or

b. The concrete has been properly tested with an appropriate ASTM standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

Prevent concrete damage during form removal. Clean all forms immediately after removal.

3.3.7.1 Special Requirements for Reduced Time Period

Forms may be removed earlier than specified if ASTM C 39/C 39M test results of field-cured samples from a representative portion of the structure indicate that the concrete has reached a minimum of 85 percent of the design strength.

3.4 FORMED SURFACES

3.4.1 Preparation of Form Surfaces

Coat contact surfaces of forms with form-coating compound before reinforcement is placed. Provide a commercial formulation form-coating compound that does not bond with, stain, nor adversely affect concrete surfaces and impair subsequent treatment of concrete surfaces that entails bonding or adhesion nor impede wetting of surfaces to be cured with water or curing compounds. Do not allow excess form-coating compound to stand in puddles in the forms nor to come in contact with concrete against which fresh concrete is placed. Make thinning of form-coating compound with thinning agent of the type, in the amount, and under the conditions recommended by form-coating compound manufacturer's printed or written directions.

3.4.2 Tolerances

ACI/MCP-4 and as indicated.

3.4.3 As-Cast Form

Provide form facing material producing a smooth, hard, uniform texture on the concrete. Arrange facing material in an orderly and symmetrical manner and keep seams to a practical minimum. Support forms as necessary to meet required tolerances. Do not use material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which can impair the texture of the concrete surface.

3.5 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

ACI/MCP-2. Provide bars, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.5.1 General

Provide details of reinforcement that are in accordance with ACI/MCP-3 and ACI/MCP-4 and as specified.

3.5.2 Vapor Barrier]

Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12 inches and tape joints. Remove torn, punctured, or damaged vapor barrier material and provide with new vapor barrier prior to placing concrete. Concrete placement must not damage vapor barrier material.

3.5.3 Reinforcement Supports

Place reinforcement and secure with non corrodible chairs or spacers . For supporting reinforcement on the ground, use concrete or other non corrodible material, having a compressive strength equal to or greater than the concrete being placed.

3.5.4 Splicing

As indicated. For splices not indicated ACI/MCP-2. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2 inches.

3.5.5 Cover

ACI/MCP-2 for minimum coverage, unless otherwise indicated.

3.5.6 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.5.7 Construction Joints

Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.

3.5.8 Expansion Joints and Contraction Joints

Make expansion joints 1/2 inch wide unless indicated otherwise. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Provide contraction joints, either formed or saw cut or cut with a jointing tool, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.5.9 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

Provide fabrication tolerances that are in accordance with ACI/MCP-1, ACI/MCP-2 and ACI/MCP-3.

Provide hooks and bends that are in accordance with ACI/MCP-3 and ACI/MCP-4.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI/MCP-3.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances

b. Bends or kinks not indicated on drawings or approved shop drawings

c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.5.10 Placing Reinforcement

Place reinforcement in accordance with ACI/MCP-3 and ACI/MCP-4.

For slabs on grade (over earth or over capillary water barrier) footing reinforcement, support bars on precast concrete blocks, spaced at intervals

required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

Contractor must cooperate with other trades in setting of anchor bolts, inserts, and other embedded items. Where conflicts occur between locating reinforcing and embedded items, the Contractor must notify the Contracting Officer so that conflicts may be reconciled before placing concrete. Anchors and embedded items must be positioned and supported with appropriate accessories.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

Provide supports for reinforcing bars that are sufficient in number and sufficiently heavy to carry the reinforcement they support, and in accordance with ACI/MCP-3, ACI/MCP-4 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

Equip supports on ground and similar surfaces with sand-plates.

Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

With the exception of temperature reinforcement, tied to main steel approximately 24 inches on center, reinforcement must be accurately placed, securely tied at intersections with 18-gage annealed wire, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to ACI/MCP-3.

Bending of reinforcing bars partially embedded in concrete is permitted only as specified in ACI/MCP-3 and ACI/MCP-4.

3.5.11 Spacing of Reinforcing Bars

Spacing must be as indicated. If not indicated, spacing must be in accordance with the ACI/MCP-3 and ACI/MCP-4.

Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to approval.

3.5.12 Concrete Protection for Reinforcement

Concrete protection must be in accordance with the ACI/MCP-3 and ACI/MCP-4.

3.6 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

ASTM C 94/C 94M, and ACI/MCP-2, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2

percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.6.1 Measuring

Make measurements at intervals as specified in paragraphs entitled "Sampling" and "Testing."

3.6.2 Mixing

ASTM C 94/C 94M and ACI/MCP-2. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.

3.6.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.7 PLACING CONCRETE

Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10 foot centers maximum in each direction when pouring interior slabs and on 20 foot centers maximum for exterior slabs.

3.7.1 General Placing Requirements

Deposit concrete continuously or in layers of such thickness that no concrete is placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as specified. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation.

Concrete to receive other construction must be screeded to proper level to avoid excessive skimming or grouting.

Do not use concrete which becomes nonplastic and unworkable or does not meet quality control limits as specified or has been contaminated by foreign materials. Use of retempered concrete is permitted. Remove rejected concrete from the site.

3.7.2 Vibration

ACI/MCP-2. Furnish a spare, working, vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4 inches in depth with high frequency mechanical vibrating equipment supplemented by hand spading and tamping. Operate internal vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Insert and withdraw vibrators approximately 20 inches apart. Penetrate the previously placed lift with the vibrator when more than one lift is required. Place concrete in 20 inch maximum vertical lifts. Use external vibrators on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.

3.7.3 Pumping

ACI/MCP-2. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.7.4 Cold Weather

ACI/MCP-2. Do not allow concrete temperature to decrease below 50 degrees FObtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.7.5 Hot Weather

Maintain required concrete temperature using Figure 2.1.5 in ACI/MCP-2 to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious

sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.7.6 Follow-up

Check concrete within 24 hours of placement for flatness, levelness, and other specified tolerances. Adjust formwork and placement techniques on subsequent pours to achieve specified tolerances.

3.7.7 Placing Concrete Slabs

Place and consolidate concrete for slabs in a continuous operation, within the limits of approved construction joints until placing of panel or section is completed.

During concrete placing operations, consolidate concrete by mechanical vibrating equipment so that concrete is worked around reinforcement and other embedded items and into corners. Consolidate concrete in remainder of slabs by vibrating bridge screeds, roller pipe screeds, or other approved method. Limit consolidation operations to time necessary to obtain consolidation of concrete without bringing an excess of fine aggregate to the surface. Concrete to be consolidated must be as dry as practical and surfaces thereof must not be manipulated prior to finishing operations. Bring concrete correct level with a straightedge and struck-off. Use bull floats or darbies to smooth surface, leaving it free of humps or hollows. Sprinkling of water on plastic surface is not permitted.

Provide finish of slabs as specified.

3.8 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

ACI/MCP-2, unless otherwise specified. Where straightedge measurements are specified, Contractor must provide straightedge.

3.8.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.8.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance as defined below,roughen the surface with stiff brushes of rakes before final set.

3.8.1.2 Floated

Use for exterior slabs where not otherwise specified. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further, until ready for floating. Whether floating with a wood, magnesium, or composite hand float, with a bladed power trowel equipped with float shoes, or with a powered disc, float must begin when the surface has

stiffened sufficiently to permit the operation. During or after the first floating, check surface with a 10 foot straightedge applied at no less than two different angles, one of which is perpendicular to the direction of strike off. Cut down high spots and fill low spots during this procedure to produce a surface level within 1/4 inch in 10 feet.

3.8.1.3 Concrete Containing Silica Fume

Finish using magnesium floats or darbies.

3.8.2 Flat Floor Finishes

3.8.2.1 Remedies for Out of Tolerance Work

Contractor is required to repair and retest any floors not meeting specified tolerances. Prior to repair, Contractor must submit and receive approval for the proposed repair, including product data from any materials proposed. Repairs must not result in damage to structural integrity of the floor. For floors exposed to public view, repairs must prevent any uneven or unusual coloring of the surface.

3.9 CURING AND PROTECTION

ACI/MCP-2 unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period.

3.9.1 General

Protect freshly placed concrete from premature drying and cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of cement and proper hardening of concrete.

Start initial curing as soon as free water has disappeared from surface of concrete after placing and finishing. Keep concrete moist for minimum 72 hours.

Final curing must immediately follow initial curing and before concrete has dried. Continue final curing until cumulative number of hours or fraction thereof (not necessarily consecutive) during which temperature of air in contact with the concrete is above 50 degrees F has totaled 168 hours. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, final curing may be terminated when the average compressive strength has reached 70 percent of the 28-day design compressive strength. Prevent rapid drying at end of final curing period.

3.9.2 Moist Curing

Remove water without erosion or damage to the structure. Prevent water run-off.

3.9.2.1 Ponding or Immersion

Continually immerse the concrete throughout the curing period. Water must not be more than 50 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.9.2.2 Fog Spraying or Sprinkling

Apply water uniformly and continuously throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.

3.9.2.3 Pervious Sheeting

Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6 inches over adjacent sheeting. Provide sheeting that is at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.

3.9.2.4 Impervious Sheeting

Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12 inches minimum. Provide sheeting not less than 18 inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting; overlap and continuously tape sheeting joints; and introduce sufficient water to soak the entire surface prior to completely enclosing.

3.9.3 Liquid Membrane-Forming Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface. Provide and maintain compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI/MCP-2 indicates that hot weather conditions cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

3.9.3.1 Application

Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two

coats of compound in a continuous operation. The total coverage for the two coats must be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound must form a uniform, continuous, coherent film that does not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Re-spray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.

3.9.3.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.

3.9.4 Curing Periods

Follow ACI/MCP-2 guidelines. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.9.5 Curing Methods

Accomplish curing by moist curing, by moisture-retaining cover curing, by membrane curing, and by combinations thereof, as specified.

Moist curing:

Accomplish moisture curing by any of the following methods:

Keeping surface of concrete wet by covering with water

Continuous water spraying

Covering concrete surface with specified absorptive cover for curing concrete saturated with water and keeping absorptive cover wet by water spraying or intermittent hosing. Place absorptive cover to provide coverage of concrete surfaces and edges with a slight overlap over adjacent absorptive covers.

Moisture-cover curing:

Accomplish moisture-retaining cover curing by covering concrete surfaces with specified moisture-retaining cover for curing concrete. Place cover directly on concrete in widest practical width, with sides and ends lapped at least 3 inches. Weight cover to prevent displacement; immediately repair tears or holes appearing during curing period by patching with pressure-sensitive, waterproof tape or other approved method.

Membrane curing:

Accomplish membrane curing by applying specified membrane-forming curing compound to damp concrete surfaces as soon as moisture film has disappeared. Apply curing compound uniformly in a two-coat operation

by power-spraying equipment using a spray nozzle equipped with a wind guard. Apply second coat in a direction at right angles to direction of first coat. Total coverage for two coats must be not more than 200 square feet per gallon of curing compound. Respray concrete surfaces which are subjected to heavy rainfall within 3 hours after curing compound has been applied by method and at rate specified. Maintain continuity of coating for entire curing period and immediately repair damage to coating during this period.

Membrane-curing compounds must not be used on surfaces that are to be covered with coating material applied directly to concrete or with a covering material bonded to concrete, such as other concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, painting, and other coatings and finish materials.

3.9.6 Curing Formed Surfaces

Accomplish curing of formed surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.9.7 Curing Unformed Surfaces

Accomplish initial curing of unformed surfaces by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified above, as applicable.

3.9.8 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.9.9 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.9.10 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.10 FIELD QUALITY CONTROL

3.10.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C 31/C 31M for making test specimens.

3.10.2 Testing

3.10.2.1 Slump Tests

ASTM C 143/C 143M. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.10.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.10.2.3 Compressive Strength Tests

ASTM C 39/C 39M. Make five test cylinders for each set of tests in accordance with ASTM C 31/C 31M. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, and hold one cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 160 cubic yards of concrete, nor less than once for each 5400 square feet of surface area for slabs . For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than f'c or if any strength test result falls below f'c by more than 450 psi, take a minimum of three ASTM C 42/C 42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test is considered structurally adequate if the average of three cores is equal to at least 85 percent of f'c and if no single core is less than 75 percent of f'c. Retest locations represented by erratic core strengths. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.10.2.4 Air Content

ASTM C 173/C 173M or ASTM C231/C231M for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.10.2.5 Strength of Concrete Structure

Compliance with the following is considered deficient if it fails to meet the requirements which control strength of structure in place, including following conditions:

Failure to meet compressive strength tests as evaluated

Reinforcement not conforming to requirements specified

Concrete which differs from required dimensions or location in such a manner as to reduce strength

Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified

Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration

Poor workmanship likely to result in deficient strength

3.10.2.6 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C 42/C 42M, and as follows:

Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

Test cores after moisture conditioning in accordance with ASTM C 42/C 42M if concrete they represent is more than superficially wet under service.

Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

Core specimens will be taken and tested by the Government. If the results of core-boring tests indicate that the concrete as placed does not conform to the drawings and specification, the cost of such tests and restoration required must be borne by the Contractor.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.11 JOINTS

3.11.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Locate construction joints as follows:

a . In slabs on ground, so as to divide slab into areas not in excess of 1,200 square feet

Joints must be perpendicular to main reinforcement. Reinforcement must be continued across construction joints.

3.11.2 Control Joints in Slabs on Ground

Provide joints to form panels as indicated.

Joints must be 1/8-inch wide by 1/5 to 1/4 of slab depth and formed by inserting hand-pressed fiberboard strip into fresh concrete until top surface of strip is flush with slab surface or by cutting the concrete with a saw after the concrete has set. After concrete has cured for at least 7 days, the Contractor must remove inserts and clean groove of foreign matter and loose particles.

3.11.3 Sealing Joints in Slabs on Ground

Isolation and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.

3.12 INSTALLATION OF ANCHORAGE DEVICES

3.12.1 General

Anchorage devices and embedded items required for other work that is attached to, or supported by, set and build in cast-in-place concrete as part of the work of this section, using setting drawings, instructions, and directions for work to be attached thereto.

3.12.2 Placing Anchorage Devices

Anchorage devices and embedded items must be positioned accurately and supported against displacement. Fill openings in anchorage devices such as slots and threaded holes with an approved, removable material to prevent entry of concrete into openings.

3.13 CONCRETE CONVEYING

3.13.1 Transfer of Concrete At Project Site

Handle concrete from point of delivery and transfer to concrete conveying equipment and to locations of final deposit as rapidly as practical by methods which prevent segregation and loss of concrete mix materials.

3.13.2 Mechanical Equipment for Conveying Concrete

Equipment must ensure a continuous flow of concrete at delivery end, as approved. Provide runways for wheeled concrete-conveying equipment from concrete delivery point to locations of final deposit. Interior surfaces of concrete conveying equipment must be free of hardened concrete, debris, water, snow, ice, and other deleterious substances.

-- End of Section --

SECTION 33 11 00

WATER PIPING

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide underground ductile iron water piping at size as indicated. Provide water main accessories including valves as specified or where indicated.

1.2 RELATED SECTIONS

NONE

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA B300	(2004) Hypochlorites
AWWA C104/A21.4	(2008) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/A21.5(2005)	Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110/A21.10	(2008) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	(2005) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C153/A21.53	(2006) Ductile-Iron Compact Fittings for Water Service
AWWA C500	(2002; R 2003) Metal-Seated Gate Valves for Water Supply Service
AWWA C509	(2001) Resilient-Seated Gate Valves for Water Supply Service
AWWA C600	(2005) Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains
AWWA C800	(2005) Underground Service Line Valves and Fittings

ASME INTERNATIONAL (ASME)

ASME B16.1 (2005) Standard for Gray Iron Threaded Fittings; Classes 125 and 250

ASTM INTERNATIONAL (ASTM)

ASTM A 536 (1984e1; R 2004) Standard Specification for Ductile Iron Castings

1.4 SUBMITTALS

Product Data: Water main piping, fittings, joints, valves, valve pits, and couplings.

Test Results: Bacteriological Disinfection.

Certificates: Shop-applied lining

O&M / Manufacturer's Instructions: Tools/Keys/Instructions for operating gate valves

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery and Storage

Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves, and hydrants free of dirt and debris.

1.5.2 Handling

Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place any other material or pipe inside a pipe or fitting after the coating has been applied. Carry, do not drag, pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Store rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.

PART 2 – PRODUCTS

2.1 WATER MAIN MATERIALS

2.1.1 Piping Materials (Ductile-Iron Piping)

2.1.1.1 Pipe and Fittings: AWWA C151/A21.51, Class 52. (Flanged pipe, AWWA C115/A21.15. Fittings, AWWA C110/A21.10 or AWWA C153/A21.53); fittings with push-on joint ends conforming to the same requirements as fittings with mechanical-joint ends, except that the bell design shall be modified, as approved, for push-on joint]. Fittings shall have pressure rating at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the specified joints. Pipe and fittings shall have cement-mortar lining, AWWA C104/A21.4, standard thickness.

2.1.1.2 Joints and Jointing Material: **Joints for pipe and fittings shall be mechanical joints unless otherwise indicated.**

Insulating Joints: Designed to effectively prevent metal-to-metal contact at the joint between adjacent sections of piping. Joint shall be of the flanged type with insulating gasket, insulating bolt sleeves, and insulating washers. Gasket shall be of the dielectric type, full face, and in other respects as recommended in the Appendix to AWWA C115/A21.15. Bolts and nuts, as recommended in the Appendix to AWWA C115/A21.15.

Flanged Joints: Bolts, nuts, and gaskets for flanged connections as recommended in the Appendix to AWWA C115/A21.15. Flange for setscrewed flanges shall be of ductile iron, ASTM A 536, Grade 65-45-12, and conform to the applicable requirements of ASME B16.1, Class 250. Setscrews for setscrewed flanges shall be 190,000 psi tensile strength, heat treated and zinc-coated steel. Gasket and lubricants for setscrewed flanges, in accordance with applicable requirements for mechanical-joint gaskets specified in AWWA C111/A21.11. Design of setscrewed gasket shall provide for confinement and compression of gasket when joint to adjoining flange is made.

Mechanical Joints: Dimensional and material requirements for pipe ends, glands, bolts and nuts, and gaskets, AWWA C111/A21.11.

Push-On Joints: Shape of pipe ends and fitting ends, gaskets, and lubricant for joint assembly, AWWA C111/A21.11.

Sleeve-Type Mechanical Coupled Joints: As specified in paragraph entitled "Sleeve-Type Mechanical Couplings."

2.1.2 Piping Materials (PVC)

All piping determined to be PVC per the drawings (process flow diagram and mechanical layout) shall gray in color and schedule 80 PVC. The pipe sizes shall be as per what is shown on the drawings.

2.1.3 Pressure Reducing Valve

The pressure reducing valve shall be 6-inches with 8-inch flanges as manufactured by Cla-val company (or equal), with model #: 694-01BCDSVKC. The valve shall be epoxy coated, Ductile with Stainless Internal Trim, 150-lb flange, rated for a flow of 1,000 gpm, and a pressure reduction from 130 psi to 30 psi, Opening and Closing speed Controls, and Position Indicator (X101);

2.1.4 Disinfection:

Chlorinating materials shall conform to Hypochlorite, Calcium and Sodium: AWWA B300.

PART 3 – EXECUTION

3.1 INSTALLATION OF PIPELINES

3.1.1 Location of Water Lines

Connect underground water main piping to the process piping lines where the process lines have been installed per the contract drawings

3.1.3 Pipe Laying and Jointing

Install pipe and fittings in accordance with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports [where indicated and] where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 3 1/2 feet.

3.1.4 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in coordination with and in accordance with the standard practices of Aqua New York.

The Contractor shall be responsible for the verification of existing piping and penetrations. Prior to ordering materials, expose all existing pipes which are to be connected to new pipelines. Verify the size, material, joint types, elevation, horizontal location, and pipe service of existing pipes, and inspect size and location of structure penetrations to verify adequacy of wall sleeves, and other openings before installing connecting pipes.

3.1.6 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.1.7 Installation of Ductile-Iron Piping, Specific

a. Jointing: Make push-on, mechanical, or flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make joints tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions, use screwed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the screwed flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. Assemble in accordance with the recommendations of the coupling manufacturer. Groove pipe in the field only with approved groove cutting equipment designed especially for the purpose and produced by a manufacturer of grooved joint couplings; secure approval for field-cut grooves before assembling the joint. Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves shall be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.

b. Allowable Deflection: The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

c. Pipe Anchorage: Provide concrete thrust blocks (reaction backing) and metal harness for pipe anchorage. Thrust blocks shall be in accordance with the requirements of AWWA C600 for thrust restraint, except that size and positioning of thrust blocks shall be as indicated. Use concrete, ASTM C 94/C 94M, having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength. Metal harness shall be in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps except as otherwise indicated.

d. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with AWWA C105/A21.5.

3.1.9 Disinfection

Prior to disinfection, obtain Contracting Officer approval of the proposed method for disposal of waste water from disinfection procedures. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 and 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the temporary GAC system being placed into service.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

Prior to hydrostatic testing, obtain Contracting Officer approval of the proposed method for disposal of waste water from hydrostatic testing. The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.

3.2.2 Testing Procedure

Provide hydrostatic testing per Aqua New York standards and local regulations. Otherwise, perform the following:

Test ductile-iron water mains in accordance with the requirements of AWWA C600 for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints shall not exceed the amounts given in AWWA C600; no leakage will be allowed at joints made by any other method.

For pressure test, use a hydrostatic pressure not less than 200 psi. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

3.3 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

END OF SECTION

SECTION 40 05 13

PIPELINES, PROCESS PIPING

PART 1 – GENERAL

1.1 SCOPE OF WORK

Provide the above-grade process pipe, pipe supports, valves, fittings, connections, equipment, and other accessories located within the treatment plant.

1.2 RELATED SECTIONS

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2008) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2008) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115/A21.15	(2005) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C150/A21.50	(2002; Errata 2003) Thickness Design of Ductile-Iron Pipe
AWWA C151/A21.51	(2002; Errata 2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
AWWA C153/A21.53	(2006) Ductile-Iron Compact Fittings for Water Service
AWWA C500	(2002; R 2003) Metal-Seated Gate Valves for Water Supply Service
AWWA C504	(2006) Standard for Rubber-Seated Butterfly Valves
AWWA C508	(2001) Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS
AWWA C509	(2001) Resilient-Seated Gate Valves for Water Supply Service
AWWA C651	(2005; Errata 2005) Standard for Disinfecting Water Mains

ASME INTERNATIONAL (ASME)

ASME B1.1	(2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.20.1	(1983; R 2006) Pipe Threads, General Purpose (Inch)
ASME B16.1	(2005) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.11	(2005) Forged Fittings, Socket-Welding and Threaded
ASME B16.20	(2007) Metallic Gaskets for Pipe Flanges - Ring-Joint, Spiral Wound, and Jacketed
ASME B16.21	(2005) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.34	(2004) Valves - Flanged, Threaded and Welding End
ASME B16.42	(1998; R 2006) Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300
ASME B16.5	(2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24
ASME B18.2.1	(1996; Addenda A 1999; Errata 2003; R 2005) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 2005) Standard for Square and Hex Nuts
ASME B31.3	(2008) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM A 126	(2004) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 183	(2003; R 2009) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A 268/A 268M	(2005a) Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service
ASTM A 269	(2008) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A 307	(2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 312/A 312M	(2009) Standard Specification for Seamless, Welded, and Heavily Worked Austenitic Stainless Steel Pipes
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel

ASTM A 423/A 423M	(1995; R 2004) Standard Specification for Seamless and Electric-Welded Low-Alloy Steel Tubes
ASTM A 47/A 47M	(1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984e1; R 2004) Standard Specification for Ductile Iron Castings
ASTM A 576	(1990b; R 2006) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality
ASTM A 632	(2004) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service
ASTM A 727/A 727M	(2002; R 2007) Standard Specification for Carbon Steel Forgings for Piping Components with Inherent Notch Toughness
ASTM A 780/A 780M	(2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 789/A 789M	(2008b) Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service
ASTM A 815/A 815M	(2009) Standard Specification for Wrought Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings
ASTM D 1784	(2008) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2241	(2005) Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2464	(2006) Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(2004e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

ASTM D 2683	(2004) Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D 2737	(2003) Polyethylene (PE) Plastic Tubing
ASTM D 2855	(1996; R 2002) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3222	(2005) Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials
ASTM F 402	(2005) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F 477	(2008) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 656	(2008) Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA TRD	(2002) Thrust Restraint Design for Ductile Iron Pipe

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25	(2008) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-58	(2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application
MSS SP-89	(2003) Pipe Hangers and Supports - Fabrication and Installation Practices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; AMD 1 2008) National Electrical Code - 2008 Edition
NFPA 704	(2006) Identification of the Hazards of Materials for Emergency Response

PLASTICS PIPE INSTITUTE (PPI)

PPI TR-21	(2001) Thermal Expansion and Contraction in Plastic Piping Systems

1.4 SUBMITTALS

The following shall be submitted:

Product Data: Manufacturer's descriptive and technical literature for each piping system, including design recommendations; pressure and temperature ratings; dimensions, type, grade and strength of pipe and fittings; thermal characteristics (coefficient of expansion and thermal conductivity); and chemical resistance to each chemical and chemical mixture in the liquid stream.

Material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) for each chemical (solvents, solvent cements, and glues) delivered for use in pipe installation.

Test Reports: Pipe Leakage Tests, Hydrostatic Tests, Valve Testing, Disinfection

As-built drawings: Show pipe anchors and guides, and layout of piping systems relative to other parts of the work including clearances for maintenance and operation. As-built piping and instrumentation diagrams (P&IDs) identifying and labeling equipment, instrumentation, valves, vents, drains, and all other inline devices; The P&IDs found in the contract drawings shall be revised to reflect the constructed process system, as directed by the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of material before, during and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, piping shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in pipe installation. At a minimum, this includes all solvents, solvent cements, glues and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM F 402. Storage facilities shall be classified and marked in accordance with NFPA 704. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation damage, or other damage. Pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendation. Plastic pipe shall be packed, packaged and marked in accordance with ASTM D 3892.

1.6 SEQUENCING AND SCHEDULING

For slab, floor, wall, and roof penetrations, keep on site pertinent wall pipes and sleeves before they are required for placement in concrete forms. Verify and coordinate the size and location of building and structure pipe penetrations before forming and placing concrete.

1.7 MAINTENANCE

1.7.1 Service

Services for automatic valve systems shall be provided by a manufacturer's representative who is experienced in the installation, adjustment and operation of the equipment specified. The representative shall inspect the installation, and supervise the adjustment and testing of the equipment.

1.7.2 Extra Materials

Concurrent with delivery and installation of the specified piping systems and appurtenances, spare parts for each different item of material and equipment specified that is recommended by the manufacturer to be replaced any time up to 3 years of service shall be furnished.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT, IN GENERAL

Provide piping materials and appurtenances as specified and as shown on the drawings, and suitable for the service intended. Piping materials, appurtenances, and equipment supplied as part of this contract shall be of equal material and ratings as the connecting pipe, new and unused except for testing equipment. Components that serve the same function and are the same size shall be identical products of the same manufacturer. The general materials to be used for the piping systems shall be in accordance with the Pipe Schedule and contract drawings. Pipe fittings shall be compatible with the applicable pipe materials.

The pressure ratings and materials specified represent minimum acceptable standards for piping systems. The piping systems shall be suitable for the services specified and intended. Each piping system shall be coordinated to function as a unit. Flanges, valves, fittings and appurtenances shall have a pressure rating no less than that required for the system in which they are installed.

Piping systems shall be suitable for design conditions, considering the piping both with and without internal pressure, and installation factors such as insulation, support spans, and ambient temperatures. Consideration shall be given to all operating and service conditions both internal and external to the piping systems.

2.1.1 Standard Products

Provide material and equipment which are the standard products of a manufacturer regularly engaged in the manufacturing of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Nominal sizes for standardized products shall be used. Pipe, valves, fittings and appurtenances shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.1.2 Identification and Tagging

Each piece of pipe shall bear the ASTM designation and all other markings required for that designation. Valves shall be marked in accordance with MSS SP-25 and shall bear an identification tag securely attached using plastic straps designed for that purpose. Identification tags shall be 1.375 inch minimum diameter, made of engraved laminated plastic. The service, valve identification number shown on the Valve Schedule and in the contract drawings, the manufacturer's name, and the valve model number shall be displayed.

2.2 DUCTILE IRON PIPING SYSTEM

2.2.1 Ductile Iron Pipe

Ductile iron pipe for pressure service shall be Class 52 and shall have a design and wall thickness conforming to AWWA C150/A21.50. Ductile iron pipe shall have a standard cement mortar lining conforming to AWWA C104/A21.4.

2.2.2 Ductile Iron Joints

Joints shall have a working pressure rating for liquids equal to the pressure rating of the connected pipe. Dielectric fittings or isolation joints shall be provided between all dissimilar metals.

2.2.2.1 Mechanical Joints

All underground DIP shall have mechanical joints. Mechanical joints shall conform to AWWA C110/A21.10 and AWWA C111/A21.11. Gaskets, glands, bolts and nuts shall be furnished in sufficient quantity for the complete assembly of each mechanical joint. Glands shall be ductile iron with an asphaltic coating. Gaskets shall be vulcanized synthetic rubber, reclaimed rubber is not acceptable. Bolts and nuts shall be heat treated carbon steel, ASTM A 183, minimum tensile 110,000 psi. Mechanical joints shall have bolt holes oriented straddling the vertical centerline of the valves and fittings

2.2.2.2 Flanged Joints

All above ground DIP shall have flanged joints and shall conform to AWWA C110/A21.10. Gaskets, bolts and nuts shall be provided with flanged joints in sufficient quantity for the complete assembly of each joint. Gaskets shall be vulcanized synthetic rubber, reclaimed rubber is not acceptable.

2.2.3 Ductile Iron Fittings

Fittings shall be gray iron ASTM A 48/A 48M or ductile iron AWWA C110/A21.10. Up to 12 inches inclusive, the fittings shall be 250 psig rated. Gray iron fittings shall be cement mortar lined standard thickness. Flanges and flanged fittings shall conform to AWWA C110/A21.10 and shall be rated for 250 psig service. Materials shall be ductile iron. For tie-in to existing flanges, field check existing flanges for nonstandard bolt hole configurations and design as required to assure new pipe and flange mate properly. Bolts and nuts shall be carbon steel conforming to ASTM A 307, Grade B. Bolts shall be provided with washers of the same material as the bolts. Gaskets shall be rubber ring or full face, maximum 0.125 inch thick.

2.3 PLASTIC PIPING SYSTEM

2.3.1 PVC Pipe

All above ground PVC pressure piping shall be PVC, ASTM D 1784, Schedule 80 conforming to ASTM D 1785. All non-pressure PVC piping shall be SDR17 or SDR40.

2.3.3 PVC Joints

The piping system shall be joined by flanged or mechanical connections except where connecting to unions, valves, and equipment with threaded connections that may require future disassembly. Connections at those points shall be threaded and back-welded. Tubing connections shall use compression fittings.

2.3.4 PVC Fittings

The schedule rating for the fittings shall not be less than that for the associated pipe.

2.3.5 PVC Solvent Cement

Socket connections shall be joined with PVC solvent cement conforming to ASTM D 2564. Manufacture and viscosity shall be as recommended by the pipe and fitting manufacturer to assure compatibility.

2.4 POLYETHYLENE TUBING SYSTEM

2.4.1 PE Tubing

Tubing shall be flexible low-density PE conforming to ASTM D 3350, and dimensioned in accordance with ASTM D 2737 with nominal size ½-inch.

2.4.2 Tubing Fittings

Fittings shall be compression type.

2.5 ISOLATION JOINTS AND COUPLINGS

2.5.1 Dielectric Fittings

Dielectric fittings shall be provided between threaded ferrous and nonferrous metallic pipe, fittings and valves. Dielectric fittings shall prevent metal-to-metal contact of dissimilar metallic piping elements and shall be suitable for the required working pressure, temperature and corrosive application.

2.5.2 Isolation Joints

Isolation joints shall be provided between nonthreaded ferrous and nonferrous metallic pipe fittings and valves. Isolation joints shall consist of an isolation gasket of the dielectric type, isolation washers and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with an outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

2.5.3 Metallic Piping Couplings

Thrust ties shall be provided where shown on the contract drawings and where required to restrain the force developed by 1.5 times the maximum allowable operating pressures specified. For metallic pipe other than ductile iron, thrust ties shall be attached with fabricated lugs. For ductile iron pipe, thrust ties shall be attached with socket clamps against a grooved joint coupling or flange. For exposed installations, zinc-plated nuts and bolts shall be used. However, high-strength, low-alloy steel, in accordance with AWWA C111/A21.11, may be substituted for use on cast iron and ductile iron couplings. For buried and submerged installations, TP304 stainless steel bolts and nuts shall be provided. Steel middle rings and followers shall be fusion bonded epoxy-lined and coated in accordance with Section 09 90 00 Paints and Coatings and pressure tested beyond yield point.

2.5.3.1 Sleeve-Type Couplings

Sleeve-type couplings shall be used for joining plain end pipe sections in a flexible manner with a diameter to properly fit the pipe. A coupling shall consist of one steel middle ring, two steel followers, two elastomeric wedge section gaskets and elliptic-neck, track-head steel bolts designed to properly compress the gaskets. For pipe sizes between 0.5 through 1.5 inch, the followers shall be ductile iron, and the middle ring shall be in accordance with ASTM A 513 with AWWA C111/A21.11 bolting. For pipe sizes 2 inch and larger, the followers shall be ASTM A 395/A 395M, and the middle ring shall be ASTM A 513 with AWWA C111/A21.11 bolting,. Gaskets shall be ethylene propylene diene monomer (EPDM)] or as recommended by the manufacturer.

2.5.3.2 Transition Couplings

Transitional couplings may be used to connect two pipes of the same material that have small differences in outside diameter. A fully assembled transitional coupling shall be sized to properly fit pipe diameters. The coupling shall consist of one ductile iron middle ring, two ductile iron followers, two elastomeric section gaskets and elliptic-neck, track-head steel bolts designed to properly compress the gaskets. The coupling shall use ethylene propylene diene monomer (EPDM)] gaskets or as recommended by the manufacturer. The coupling shall be sized to match the associated piping.

2.5.3.3 Flanged Coupling Adapters

Flanged coupling adapters shall be fully assembled units manufactured to meet ASTM A 126 Class B, cast iron. The flanges shall mate with ASME B16.1 flanges of the same nominal size. A factory applied corrosion resistant coating shall be applied. The coupling shall use ethylene propylene diene monomer (EPDM)] gaskets or as recommended by the manufacturer. Where pipe movement out of the adaptor may occur, proper anchorage of the pipe shall be provided. The coupling shall be sized to match the associated piping.

2.5.4 Couplings for Nonmetallic Piping

2.5.4.1 Bellows Coupling

A bellows coupling shall have a minimum of two polytetrafluoroethylene (PTFE) convolutions unless otherwise shown, with ductile iron flanged, faced and drilled to ASME B16.1 end connections, and metal reinforcing bands. The maximum allowable working pressure shall be 140 psig at 120 degrees F. Bolting shall be limited to restrain the force developed by 1.5 times the specified maximum allowable operating pressure. The coupling shall be sized to match the associated piping.

2.5.4.2 Compression Coupling

A compression coupling shall consist of one steel middle section, two steel mechanical nuts, two elastomeric gaskets and two machined steel lock rings. The coupling shall use ethylene propylene diene monomer (EPDM)] gaskets or as recommended by the manufacturer. . The maximum allowable working pressure shall be 150 psig at 120 degrees F. The coupling shall be sized to match the associated piping.

2.6 VALVES

2.6.1 General Requirements for Valves

Valves shall include operator, actuator, handwheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and all other accessories required for a complete operation. The valves shall be suitable for the intended service. Renewable parts are not to be of a lower quality than those specified. [Valves shall be the same size as adjoining pipe]. Valve ends shall be compatible with adjacent piping system. An operator shall be sized to operate the associated valve for the full range of pressures and velocities. Valves will open by turning counterclockwise. Operators, actuators, and accessories shall be factory mounted.

2.6.2 Factory Finishing

Valves shall have an epoxy lining and coating in accordance with AWWA C550 unless otherwise specified. The epoxy shall be either a two-part liquid material or a heat-activated (fusion) material except that only a heat-activated material shall apply if a valve coating is specified as "fusion" or "fusion bonded" epoxy. The epoxy lining and coating shall have a minimum 7.0 mils dry film thickness except where it is limited by valve operating tolerances. Exposed valves shall be finished in accordance with Section 09 90 00 “Paints and Coatings”.

2.6.3 Check Valves

2.6.3.1 Swing Check Valves: Swing check valves, 2 inch through 36 inch, shall conform to AWWA C508, and have ASME B16.1 flanged end connections. Valves shall have a cast iron body, bronze-mounted disc, solid bronze hinges, and a stainless steel hinge shaft. Valves 2 inch through 12 inch shall be rated for 175 psig service and valves 14 through 36 inch shall be rated for 150 psig service at 140 degrees F. Valves shall be fitted with an adjustable outside lever and spring. An increasing-pattern body valve may be used where increased outlet piping size is shown.

2.6.3.2 Ball Check Valve: Ball check valves, 1 inch and larger, shall be in accordance with ASME B16.11, threaded ends, and cast iron bodies with a cleanout and floating type hollow steel ball. Flanges shall be ASME B16.1 Class 125. Valves shall be rated for 100 psig service and shall be suitable for vertical or horizontal flow.

2.6.4 Ball Valves, General Purpose: General purpose ball valves shall conform to the following:

Ball valves, 2 inch and smaller, shall be end entry type with bronze bodies and threaded, in accordance with ASME B1.20.1, regular ports. Valves shall have polytetrafluoroethylene (PTFE) seats and packing, brass balls hand lever operators. Valves shall be rated for 150 psig service at 150 degrees F. A union shall be installed adjacent to the valves to provide access to the seat.

2.6.5 Gate Valves, General Service: General service gate valves shall conform to the following:

Gate valves, 2.5 inch and larger, shall have Ni-resistant cast-iron bodies with iron trim. Valves shall meet the requirements of AWWA C500 and have Class 125 flanged end connections. Bonnet shall be a clamp type. Discs shall be wedge type of ductile iron construction, and have nonrising stems. Each gate valve, 16 inch and larger, shall include a by-pass of the same materials as the gate valve. The bypass shall meet the requirements of AWWA C500. Valves shall be rated for 200 psig service. Valves shall be equipped with handwheel operators.

2.6.6 Butterfly Valves, Standard Service

Butterfly valves, 2 inch and larger, shall have carbon steel bodies, lugged styled with ASME B16.1 flanged. Valves shall conform to AWWA C504 Class 125. Discs shall be contoured ASTM A 436 Type 1 Ni-resist cast iron with maximum lead content of 0.003 percent. The valve shafts shall be stainless steel with self-lubricating, corrosion-resistant sleeve type bearings. Valve seats for 24 inch and smaller valves shall be attached to either the valve body or the disc and shall be constructed of chloroprene. Valves shall have hand wheel or chain wheel operators.

2.6.7 Operators

Manual Operator: The force in a manual operator shall not exceed 39.3 pounds under any operating condition, including initial breakaway. The operator shall be equipped with gear reduction when force exceeds 39.3 pounds. The manual operator shall be a self-locking type or shall be equipped with a self-locking device. A position indicator shall be supplied on quarter-turn valves. Worm and gear operators shall be a one-piece design with worm-gears of gear bronze material. Worm shall be hardened alloy steel with the thread ground and polished. Traveling nut type operators shall have threader steel reach rods with an internally threaded bronze or ductile iron nut.

Exposed Operators: Exposed operators shall have galvanized and painted handwheels. Lever operators are allowed on quarter-turn valves 8 inch and smaller. Cranks shall be supplied on gear type operators. If located off of the operator floor, chain wheel operator with tiebacks, extension stem, floor stands, and other accessories shall be provided to permit operation from normal operation level. Valve handles shall be capable of padlocking, and wheels shall be lockable with a chain and padlock.

2.6.8 Valve Accessories

2.6.8.1 Chain Wheel and Guide

A chain wheel and guide shall be the handwheel direct-mount type, complete with galvanized chain on valves located higher than 6 feet.

2.7 DRAINS

Valved drains may not be shown on the detailed drawings for individual pipelines; their absence will not relieve the Contractor of the responsibility for providing and installing them as indicated in the piping and instrumentation diagrams to complete the piping system for the use intended.

2.7.1 Locations

All pipeline low points shall be drained.

2.7.2 Sizes

For pipelines 2.5 inch and larger, drains shall be 0.75 inch and equipped with ball valves. For pipelines 2 inch and smaller, drains shall be 1/2 inch and equipped with ball valves.

2.8 SAMPLE PORTS

Sample ports, shown on the flow diagrams and piping and instrument diagrams of the contract drawings, may not be shown on the detailed drawings of the individual pipelines; their absence shall not relieve the Contractor of the responsibility for providing them. Sample ports shall be provided as indicated in the piping and instrument diagrams to complete the piping systems for the use intended. The sample ports shall be located in easily accessible locations, and shall avoid potential stagnant points and/or areas where material could collect.

2.9 MISCELLANEOUS PIPING COMPONENTS

2.9.1 Air Release

Air release vents shall be located, and vented, such that a hazardous atmosphere will not be created upon operation. Air release shall be located as indicated on the contract drawings and at all high points.

2.9.2 Indicating Devices

Instrumentation and Indicating Devices such as pressure gauges are located in Section 40 95 00 “Instrumentation and Process Control”.

2.9.3 Expansion Joints

Provide all structural work and equipment required to control expansion and contraction of piping. Verify that the anchors, guides, and expansion joints provided, adequately protect the piping systems. Provide expansion joints for ductile iron piping at connections to equipment as shown on the drawings.

2.9.4 Rupture Discs

Rupture discs shall be as indicated in contract drawings. Discs shall be as supplied by the liquid phase GAC system supplier.

2.9.5 Pressure Reducing Valve

The pressure reducing valve shall be 6-inches with 8-inch flanges as manufactured by Cla-val company (or equal), with model #: 694-01BCDSVKC. The valve shall be epoxy coated, Ductile with Stainless Internal Trim, 150-lb flange, rated for a flow of 1,000 gpm, and a pressure reduction from 130 psi to 30 psi, Opening and Closing speed Controls, and Position Indicator (X101);

2.10 PIPE SUPPORTS AND PENETRATIONS

Provide auxiliary steel where the support of piping systems and equipment is required between building structural elements. Light gauge and structural steel shapes shall conform to the requirements of ASTM A 36/A 36M. The Contractor has the option to use pre-engineered support systems of electrogalvanized steel products. However, a mixture of support system manufacturers products is not permitted. Where auxiliary steel is indicated as stainless steel, provide TP304 stainless steel conforming to ASTM A 167, No. 1 Finish.

2.10.1 Pipe Supports

Pipe supports shall conform to the requirements of MSS SP-58, MSS SP-69, and MSS SP-89. Where pipe supports contact bare piping or in-line devices, provide supports of compatible material so that neither shall have a deteriorating action on the other. The absence of pipe supports and details on the Contract Drawings does not relieve the Contractor of responsibility for sizing and providing supports throughout the facility.

2.10.1.1 Beam Clamps

For upper attachments on structural steel, provide beam clamps of ASTM A 36/A 36M carbon steel and MSS SP-58 Types 19 through 23, 25 or 27 through 30. Holes drilled in structural steel for hanger support rods will not be permitted. Clamps shall be provided with hardened steel cup-point set screws and lock-nuts for anchoring in place. Clamp size selection shall only be based on the support of the required load.

2.10.1.2 Riser Clamps

Vertical runs of piping shall be supported at each floor, or closer where required, with ASTM A 36/A 36M carbon steel clamps bolted around pipes and attached to the building construction. Two bolt-type clamps designed for installation under insulation shall be used on insulated pipe runs.

2.10.1.3 Brackets

Where piping is run adjacent to walls or steel columns, provide welded ASTM A 36/A 36M steel brackets, pre-punched with a minimum of two fastener holes.

2.10.1.4 Offset Pipe Clamp

Where pipes are indicated as offset from wall surfaces, supply a double-leg design two-piece pipe clamp.

2.10.1.5 Racks

Multiple pipe racks or trapeze hangers shall be fabricated from ASTM A 36/A 36M steel, and designed to suit the conditions at the points of installation. Pipes shall be kept in their relative positions to each other by the use of clamps or clips. Pipelines subject to thermal expansion must be free to slide or roll.

2.10.1.6 Hangers

Hangers shall be fabricated of ASTM A 36/A 36M carbon steel. All hangers shall be of a uniform type and material for a given pipe run and application. Coated or plated hangers shall be used to isolate steel hangers from dissimilar metal tube or pipe. Hangers for pipe sizes 2.5 inch or larger shall incorporate a means of vertical adjustment after erection while supporting the load. For piping systems with liquid temperatures up to 122 degrees F the following shall be used: MSS SP-58

Types 1,3 through 12, Types 24 and 26 with overhead support, or Types 35 through 38 with support from below.

2.10.1.7 Hanger Rods

Hanger rods shall be carbon steel conforming to ASTM A 576. The diameter of the rods for piping system support shall conform to ASME B31.1.

2.10.2 Wall Penetrations

2.10.2.1 Above Grade Wall Penetrations

Piping which passes through fire-rated or smoke-rated walls, floors, or ceilings shall be provided with insulated and encased pipe sleeves. Penetrations through an existing fire or fire barrier wall shall be sealed with a fire stop system that has an "F" rating not less than the required fire resistance rating of the penetrated wall. The fire stopping sealant for metal piping systems shall be a water based, vibration resistant, polysiloxane (also known as silicone) based, non-slumping, premixed sealant with intumescent properties, that is rated for 3 hours pursuant to ASTM E 814 and UL requirements. The fire stopping sealant for plastic and insulated piping systems shall be a polysiloxane (also known as silicone) based, non-slumping, premixed sealant with intumescent properties that is vibration and moisture resistant, and is rated for 3 hours pursuant to ASTM E 814 and UL requirements with metal collars. Vented plastic pipe penetrations shall be fitted with galvanized steel collars that have intumescent inlays.

2.10.2.2 Below-Grade Wall Penetrations

Below-grade wall penetrations shall be provided with hydrostatic seals designed to seal opening between pipe or conduit and a through-structure opening. The seals shall be polysiloxane (also known as silicone) based, non-slumping, vibration and water resistant sealant with intumescent properties.

2.10.2.3 Galvanizing

Galvanizing shall be hot-dip applied and meet the requirements of ASTM A 153/A 153M. Stainless steel components may be substituted where galvanizing is specified.

2.11 MISCELLANEOUS MATERIALS

2.11.1 Pipe Insulation Material

Not applicable.

PART 3 – EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 PREPARATION

3.2.1 Protection

Pipe and equipment openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage.

3.2.2 System Preparation

3.2.2.1 Pipe and Fittings

Pipe and fittings shall be inspected before exposed piping is installed or buried piping is lowered into the trench. Clean the ends of pipes thoroughly, remove foreign matter and dirt from inside of pipes, and keep piping clean during and after laying.

3.2.2.2 Damaged Coatings

Repair damaged coating areas in the field with material equal to the original coating, except for damaged glass-lined pipe which shall be promptly removed from the site. Do not install damaged piping materials. Field repair of damaged and uncoated areas of galvanized piping shall conform to ASTM A 780/A 780M.

3.2.2.3 Field Fabrication

Notify the Contracting Officer at least 2 weeks prior to the field fabrication of pipe or fittings and at least 3 days prior to the start of any surface preparation or coating application work. Fabrication of fittings shall be performed in accordance with the manufacturer's instructions.

3.3 EXPOSED PIPING INSTALLATION

Exposed piping shall be run as straight as practical along the alignment shown on the contract drawings and with a minimum of joints. Piping and appurtenances shall be installed in conformance with reviewed shop drawings, manufacturer's instructions and ASME B31.3. Piping shall be installed without springing or forcing the pipe.

3.3.1 Anchors and Fasteners

Impact expansion (hammer and explosive charge drive-type) anchors and fastener systems are not acceptable. Lead shields, plastic or fiber inserts, and drilled-in plastic sleeve/nail drive systems are also not acceptable.

3.3.2 Piping Expansion and Contraction Provisions

The piping shall be installed to allow for thermal expansion and contraction resulting from the difference between installation and operating temperatures. Design for installation of plastic pipe exposed to ambient conditions or in which the temperature variation of the contents is substantial shall have provisions for movement due to thermal expansion and contraction documented to be in accordance with PPI TR-21. Anchors shall be installed as shown in the contract drawings to withstand expansion thrust loads and to direct and control thermal expansion. An intermediate pipe guide shall be installed for every pipe at each metal channel framing support not carrying an anchor or alignment guide. Where pipe expansion joints are required, pipe alignment guides shall be installed adjacent to the expansion device and within four pipe diameters. Expansion devices shall be installed in accordance with the manufacturer's instructions and at the locations shown in the contract drawings.

3.3.3 Piping Flexibility Provisions

Thrust protection shall be provided as required. Flexible couplings and expansion joints shall be installed at connections to equipment, and where shown on the contract drawings. Additional pipe anchors and flexible couplings beyond those shown on the contract drawings, shall be provided to facilitate piping installation, in accordance with reviewed shop drawings.

3.3.4 Couplings, Adapters and Service Saddles

Pipes shall be thoroughly cleaned of oil, scale, rust, and dirt in order to provide a clean seat for gaskets. Gaskets shall be wiped clean prior to installation. Flexible couplings and flanged coupling adapter gaskets shall be lubricated with the manufacturer's standard lubricant before installation on the pipe ends. Couplings, service saddles, and anchor studs shall be installed in accordance with manufacturer's instructions. Bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness. Torque-limiting wrenches shall be used to tighten bolts.

3.3.5 Piping Equipment/Component Installation

Piping components and indicators shall be installed in accordance with manufacturer's instructions. Required upstream and downstream clearances, isolation valves, and miscellaneous devices shall be provided for an operable installation. The upstream and downstream lengths of undisturbed piping shall be in accordance with flow indicator manufacturer's recommendations.

Local Indicators: All direct-reading indicator devices and pressure gauges shall be installed so that they can be easily read from floor level, and are readily accessible for maintenance and service. Pressure gauges and shall be installed where indicated in the contract drawings. Differential pressure gauges shall be installed across the process equipment indicated in the contract drawings, in accordance with the manufacturer's recommendations, and arranged for easy observation.

3.3.6 Pipe Flanges

Pipe flanges shall be set level, plumb, and aligned. Flanged fittings shall be installed true and perpendicular to the axis of the pipe. The bolt holes shall be concentric to the centerline of the pipe and shall straddle the vertical centerline of the pipe.

3.3.7 Valve Locations

Valves shall be located in accordance with the contract drawings where actuators are shown. Where actuators are not shown, valves shall be located and oriented to permit easy access to the valve operator, and to avoid interferences.

3.3.8 Pipe Tap Connections

Taps to pipe barrels are unacceptable. Taps to ductile iron piping shall be made only with a service saddle or at a tapping boss of a fitting, valve body, or equipment casting. Taps to steel piping shall be made only with a welded threadolet connection.

3.3.9 Plastic Pipe Installation

All plastic pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations. Heat joining shall be performed in accordance with ASTM D 2657. Electrofusion joining shall be performed in accordance with ASTM F 1290. Schedule 40 pipe shall not be threaded. Schedule 80 threaded nipples shall be used where necessary to connect to threaded valves or fittings. Strap wrenches shall be used for tightening threaded plastic joints, and care shall be taken not to over tighten these fittings. Pipe shall not be laid when the temperature is below 40.1 degrees F nor above 90 degrees F when exposed to direct sunlight. Any plastic pipe installed above grade and outdoors shall be ultraviolet (UV) protected or UV resistant. The pipe ends that are to be joined shall be shielded from direct sunlight prior to and during the laying operation. Adequate ventilation shall be provided when working with pipe joint solvent cement and the handling of solvent cements, primers and cleaners shall be in accordance with ASTM F 402. Provide and install supports and hangers in accordance with the manufacturer's recommendations. All lines shall be hydrostatically tested at the maximum operating pressures.

3.3.9.1 PVC Piping

Solvent-cemented joints shall be constructed in accordance with ASTM D 2855.

3.3.10 Insulation

Insulation shall be installed on piping as indicated in accordance with the provisions of Section 22 07 19 “Plumbing Piping Insulation”.

3.4 BURIED PIPE PLACEMENT

3.4.1 Location of Water Lines

Connect underground water main piping to the process piping lines where the process lines have been installed per the contract drawings

3.4.2 Pipe Laying and Jointing

Install pipe and fittings in accordance with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports [where indicated and] where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 3 1/2 feet.

3.4.3 Connections to Existing Water Lines

Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Make connections to existing lines under pressure in coordination with and in accordance with the standard practices of Aqua New York.

The Contractor shall be responsible for the verification of existing piping and penetrations. Prior to ordering materials, expose all existing pipes which are to be connected to new pipelines. Verify the size, material, joint types, elevation, horizontal location, and pipe service of existing pipes, and inspect size and location of structure penetrations to verify adequacy of wall sleeves, and other openings before installing connecting pipes.

3.4.4 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.4.5 Installation of Ductile-Iron Piping, Specific

a. Jointing: Make push-on, mechanical, or flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make joints tight; avoid undue strain on flanges, fittings, valves,

and other equipment and accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions, use screwed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the screwed flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer. Assemble in accordance with the recommendations of the coupling manufacturer. Groove pipe in the field only with approved groove cutting equipment designed especially for the purpose and produced by a manufacturer of grooved joint couplings; secure approval for field-cut grooves before assembling the joint. Make insulating joints with the gaskets, sleeves, washers, bolts, and nuts previously specified for this type joint. Assemble insulating joints as specified for flanged joints, except that bolts with insulating sleeves shall be full size for the bolt holes. Ensure that there is no metal-to-metal contact between dissimilar metals after the joint has been assembled.

b. Allowable Deflection: The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

c. Pipe Anchorage: Provide concrete thrust blocks (reaction backing) and metal harness for pipe anchorage. Thrust blocks shall be in accordance with the requirements of AWWA C600 for thrust restraint, except that size and positioning of thrust blocks shall be as indicated. Use concrete, ASTM C 94/C 94M, having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2 1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength. Metal harness shall be in accordance with the requirements of AWWA C600 for thrust restraint, using tie rods and clamps except as otherwise indicated.

d. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with AWWA C105/A21.5.

3.5 CONNECTING DISSIMILAR PIPE

Flexible transition couplings, dielectric fittings and isolation joints shall be installed in accordance with the manufacturer's instructions.

3.6 EXTERNAL CORROSION PROTECTION

Protect all pipe and piping accessories from corrosion and adverse environmental conditions.

3.6.1 Above Grade Metallic Piping

Nonferrous and stainless steel piping shall not be painted except for aluminum alloy piping. Where dissimilar metals are joined, isolation joints shall be used.

3.6.1.1 Ferrous Piping

Shop primed surfaces shall be touched up with ferrous metal primer. Surfaces that have not been shop primed shall be solvent cleaned. Surfaces that contain loose rust, mill scale or other foreign substances shall be mechanically cleaned by power wire brushing and primed with a ferrous metal primer. Primed

surfaces shall be finished with two coats of exterior vinyl paint in accordance with Section 09 90 00 Paints and Coatings".

3.7 FLEXIBLE JOINTS AT CONCRETE STRUCTURES

Flexible joints shall be provided at the face of all structures, whether or not shown on the contract drawings. Rubber ring joints, mechanical joints, flexible couplings, and proprietary restrained ductile iron pipe joints shall be considered flexible joints; welded pipe joints shall not. Joints may be flush with the structure face or may be located up to 1 pipe diameter away from face, but not further than 17.7 inches away from face. For pipelines larger than 18 inch in diameter the first joint shall be within 1 pipe diameter.

3.8 CLOSURES

Closure pieces shall be installed as necessary to end pipe runs and shall conform to ASME B16.9 or ASME B16.11. Elastomer sleeves bonded to pipe ends are not acceptable. Pressure piping shall have closures of blind flanges, unless otherwise shown on contract drawings or approved by the Contracting Officer. Pipes with restrained joints shall have pipe closures installed with thrust tie-rod assemblies.

3.9 PENETRATIONS

Steel pipe sleeves shall be hot-dipped galvanized after fabrication for above grade applications in non-submerged areas. For below grade, or in submerged and damp environments, steel pipe sleeves shall be lined and coated as specified in Section 09 90 00 Paints and Coatings. Embedded metallic piping shall be isolated from concrete reinforcement using coated pipe penetrations. Coatings shall be as specified in Section 09 90 00 Paints and Coatings. Wall pipes shall be securely supported by form work to prevent contact with reinforcing steel and tie-wires. Joints shall be caulked with rubber sealant or sealed with a wall penetration seal. For existing concrete walls, rotary drilled holes may be provided in lieu of sleeves.

3.10 VALVE INSTALLATION

Flanged valve bolt holes shall be installed so as to straddle the vertical centerline of pipe. Flanged faces shall be cleaned prior to inserting the gasket and bolts, and then the nuts shall be tightened progressively and uniformly. Threaded ends shall have the threads cleaned by wire brushing or swabbing prior to installation.

3.10.1 Valve Orientation

The operating stem of a manual valve shall be installed in a vertical position when the valve is installed in horizontal runs of pipe having centerline elevations 4.5 feet or less above finished floor, unless otherwise shown on contract drawings. The operating stem of a manual valve shall be installed in a horizontal position in horizontal runs of pipe having centerline elevations between 4.5 feet and 6.75 feet above finish floor, unless otherwise shown on contract drawings. Automatic valves shall be installed in accordance with the manufacturer's instructions.

3.10.1.1 Butterfly Valves

Orientation of butterfly valves shall take into account changes in pipe direction. Valve shafts shall be oriented so that unbalanced flows caused by pipe direction changes or other disturbances are equally divided to each half of the disc.

3.10.2 Line Size Ball Valves

A line size ball valve and union shall be installed upstream of each solenoid valve, in-line flow switch, or other in-line electrical device, excluding magnetic flow meters, for isolation during maintenance.

3.10.3 Chain Wheel and Guide

Chain wheel and guide assemblies or chain lever assemblies shall be installed on manually operated valves located over 6.73 feet above finished floor elevation. Where chains hang in normally traveled areas, appropriate "L" type tie-back anchors shall be used.

3.11 AIR RELEASE, DRAINS AND SAMPLE PORTS

Sample ports shall be provided where indicated on the contract drawings. Install specified vents at piping high points for entrapped air release and install drains in the low points of pipelines regardless of whether shown on contract drawings.

3.12 PIPING SUPPORT SYSTEMS INSTALLATION

The absence of pipe supports and details on the contract drawings shall not relieve the Contractor of responsibility for sizing and providing supports throughout plant.

3.12.1 General Support Requirements

Pipe support systems shall meet the requirements of MSS SP-58. Contractor-designed and selected support systems shall be installed in accordance with MSS SP-69, and as specified herein. Piping connections to equipment shall be supported by pipe supports and not off the equipment. Large or heavy valves, fittings, and/or equipment shall be supported independently of associated piping. Pipes shall not be supported off other pipes. Supports shall be provided at piping changes in direction or in elevation, adjacent to flexible joints and couplings, and where otherwise shown on the contract drawings. Pipe supports and hangers shall not be installed in equipment access areas. Hanging pipes shall be braced against horizontal movement by both longitudinal and lateral sway bracing. At each channel type support, every pipe shall be provided with an intermediate pipe guide, except where pipe anchors are required. Existing support systems may be used to support additional new piping only if the Contractor can demonstrate that the existing support systems are adequate for the additional loads, or if the existing systems are strengthened to support the additional loads. Pedestal type pipe supports shall be provided under base flanges adjacent to rotating equipment and where required to isolate vibration. Piping 2.5 inch in diameter and larger shall be braced for seismic forces. Lateral supports for seismic loads shall be installed at all changes in direction.

3.12.2 Support Methods

Piping support and spacing shall be provided as specified and as shown in the contract drawings, in addition to supplemental support as needed in the field. Single horizontal suspended piping shall be supported by adjustable swivel-ring hangers. Multiple horizontal suspended piping shall be supported by trapeze hangers with channel type supports. Horizontal pedestal mounted piping shall have saddle type supports. Horizontal wall mounted piping shall have wall brackets. Vertical piping shall be supported by wall brackets, base elbows, or riser clamps on floor penetrations.

3.13 PIPE IDENTIFICATION, PAINTING AND COLOR CODING

Color, coating, and lettering requirements for exposed piping shall be in accordance with Section 09 90 00 Paints and Coatings. A single individual band, of plastic adhesive tape or paint, designating pipe contents shall be provided with sufficient length to permit the stenciling of pipe contents in letters. Identification shall be provided at branch connections, inlets and outlets of equipment, every 19.7 feet of straight run, upstream of valves, and within 3.3 feet of entrance to or exit from wall curtains, or other similar type barrier.

3.14 FIELD QUALITY CONTROL

3.14.1 Hydrostatic Tests

Where any section of a pipeline is provided with concrete thrust blocking for fitting, the hydrostatic tests shall not be made until at least 5 days after the installation of the concrete thrust blocking, unless otherwise approved by the Contracting Officer.

3.14.1.1 Exposed Piping

Hydrostatic testing shall be conducted in accordance with ASME B31.3. Piping systems shall be tested under normal service conditions (as indicated in the Pipe Schedule in the contract drawings) to demonstrate compliance. The test pressure shall not be less than 1.5 times the design pressure. Water shall be used as the hydrostatic test fluid. Provide clean test water of such quality to prevent corrosion of the piping system materials. Air release vents shall be opened at all high points of the piping system in order to purge air pockets while the piping system is filling.

3.14.1.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a delay, underground piping jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Tests for above ground pressure piping shall be conducted after the piping has been completely installed, including all supports, hangers, and anchors, and inspected for proper installation but prior to installation of insulation.

3.14.2 Pipe Leakage Tests

Unless approved by the Contracting Officer, leakage testing shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the piping shall be subjected to not less than 200 psig pressure. Leakage is defined as the quantity of the test liquid, water that is supplied to the piping system, or any valved or approved section thereof, in order to maintain pressure within 5 psi of the specified leakage test pressure after the piping has been filled with the test liquid and all air is expelled. No piping installation will be accepted if leakage exceeds the allowable leakage determined by the following formula:

$L = Cf \times N \times D \times P0.5$
Cf = conversion factor = 0.0001351
L = allowable leakage, gallons per hour
N = number of joints in the length of piping tested
D = nominal pipe diameter, inches
P = average test pressure during the test, psig.

Should any test disclose leakage greater than that allowed, the leaks shall be located and repaired until the leakage is within the specified allowance, without additional cost.

3.14.3 Testing New to Existing Connections

New piping connected to existing pipe, existing equipment, existing treatment systems, or tanks and treatment systems furnished under other Sections shall be tested. Isolate the new piping with pipe caps, spectacle blinds, or blind flanges. The joint between new piping and existing piping shall be tested by methods that do not place the entire existing system under the test load. Proceed then, with the testing of new piping systems as specified herein.

3.14.4 Valve Testing

Valves may either be tested while testing pipelines, or as a separate step. It shall be demonstrated that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the

other, and in both directions for two-way valve applications. Count and record the number of turns required to open and close each valve, and account for any discrepancies with manufacturer's data. Air and vacuum relief valves shall be examined as the associated pipe is being filled to verify venting and seating is fully functional. Set, verify, and record set pressures for all relief and regulating valves. Self-contained automatic valves shall be tested at both maximum and minimum operating ranges, and reset upon completion of test to the design value.

3.15 FINAL CLEANING

3.15.1 Interim Cleaning

Prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, and other foreign material within piping sections during fabrication. The piping shall be examined to assure removal of these and other foreign objects prior to assembly and installation.

3.15.2 Flushing

Following assembly and testing, and prior to final acceptance, piping systems shall be flushed with water to remove accumulated construction debris and other foreign matter. The piping shall be flushed until all foreign matter is removed from the pipeline. Provide all hoses, temporary pipes, ditches, and other items as required to properly dispose of flushing water without damage to adjacent properties. The minimum flushing velocity shall be 2.5 fps. For large diameter pipe where it is impractical to flush the pipe at the minimum flushing velocity, the pipeline shall be cleaned in-place from the inside by brushing and sweeping, then flushing the pipeline at a lower velocity. Cone strainers shall be installed in the flushing connections of attached equipment and left in place until cleaning is completed. Accumulated debris shall be removed through drains, or by removing spools or valves.

3.16.3 Disinfection

Before acceptance of piping system operation, each section of completed pipeline shall be disinfected in accordance with AWWA C651. After pressure tests have been made, the piping section to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be sodium hypochlorite. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the piping in an approved manner. PVC pipe lines shall be chlorinated using only the above specified chlorinating material in solution. In no case shall the agent be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. All valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each outlet on the line shall be opened and closed several times. From several points in the pipeline section, Contractor personnel, approved by the Contracting Officer, shall take samples in sterilized containers and have a bacterial examination performed by a commercial laboratory in accordance with state approved methods. The commercial laboratory must be certified by the state's approving authority for examination of potable water. The disinfection shall be repeated until the piping system passes the bacterial examination for 2 consecutive days. The piping system will not be accepted until satisfactory bacteriological results have been obtained.

3.16 WASTE WATER DISPOSAL

The water used for testing, cleaning, flushing and/or disinfection shall be disposed of in accordance with all applicable regulations. Disposal is solely the responsibility of the Contractor. The method proposed for disposal of waste water shall be provided to, and approved by, the Contracting Officer prior to performing any testing, cleaning, flushing and disinfection activities.

3.17 MANUFACTURERS' FIELD SERVICES

Obtain manufacturer's technical assistance for Contractor training, installation inspection, start up, and owner operating and maintenance training. Follow manufacturer's instructions for installation.

END OF SECTION

SECTION 40 95 00

INSTRUMENTATION AND PROCESS CONTROL

PART 1 – GENERAL

1.1 SCOPE OF WORK (SYSTEM DESCRIPTION)

Furnish instrumentation as specified and as shown on the Construction Drawings. All instrumentation shall be consistent and compatible with existing systems. This includes local wiring, connections to process pipe, and other accessories required for the instrumentation and controls to safely and accurately operate.

1.2 SUBMITTALS

Product Data: Manufacturer's descriptive and technical literature, data sheets, performance charts and installation instructions. Product specific catalog cuts shall be in booklet form, indexed to the unique identifiers, and shall consist of data sheets that document compliance with the specification. Where multiple components are shown on a catalog cut, the application specific component shall be marked.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Standard Products

Materials and equipment shall be standard unmodified products of a manufacturer regularly engaged in the manufacturing of such products. Units of the same type of equipment shall be products of a single manufacturer. Items of the same type and purpose shall be identical and supplied by the same manufacturer, unless replaced by a new version approved by the Government.

1. All instrumentation shall be consistent and compatible with the existing system.

2. All instrumentation supplied shall be of the Manufacturers' latest design and shall produce or be activated by signals which are established standards for the water industry.

3. All electronic instrumentation, if used, shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 MA (milli-amperes direct current).

4. All instruments shall be provided with the Manufacturers' standard mounting hardware.

5. All indicators or recorder readouts if used shall be linear in process units.

6. Electronic equipment shall be suitably coated to prevent contamination by dust, moisture and fungus. Solid state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and outdoor environment.

2.1.2 Nameplates

Each major component of equipment shall have the manufacturer's name and address, and the model and serial number in a conspicuous place.

2.2 GENERAL REQUIREMENTS

1. All analog transmitter and controller outputs shall be 4 to 20 mA into a load of 0 to 750 ohms, unless specifically noted otherwise.

2. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

3. Enclosures shall be per NEMA 4X.

4. Unless specified otherwise, all instruments must be consistent with the similar, existing instruments located at this facility.

2.3 MONITORING INSTRUMENTATION

2.3.1 Flow Sensor & Transmitter

Turbine flow meter suitable for 8" pipe size along with accompanying fittings. Following are the details:

Type:	Turbine; Direct Read Manual
Construction:	Meets or exceeds all sections of Standard ANSI/AWWA C701 Class II, most recent revision for cold water turbine meters with AWWA bronze main cases.
Design/Operation:	Velocity Type Flow measurement; Turbine Type
Pressure	175 PSI @68° F
Temperature	0-150 ° F.
Flow range	500 to 1,200 gpm
Size:	6-inch
End Connection:	Flange
Manufacturer:	McMaster-Carr (Item Number 4189K13) or equal

2.3.2 Pressure Instrumentation

2.3.2.1 Pressure Gauge

The pressure gauge shall be liquid filled bourdon tube type. The pressure gauge shall indicate the pressure entering and exiting each GAC adsorber and shall measure in psi gage with a range, plus or minus 10 percent of design range and shall be furnished with display to the nearest 1 psi and shall have a range of 0 to 150 psi The pressure gauges shall have 4 ½" face diameter with a stainless steel bourdon tube in a phenolic case housing.

2.3.3.2 Wet/Wet Differential Pressure

One differential pressure transmitter to monitor differential pressure across all GAC units.

Type:	Differential Gauge
Mounting Location:	Bottom
Construction:	Aluminum
Dial Size:	4.5 inch

O-Rings/Diaphragm:	Buna-N
Accuracy:	+/- 2%
Differential Pressure:	0-25 psid
Working Pressure:	200 psig or higher
Process connection:	¼" Female NPT
Model & Manufacturer:	Ashcroft Type 1131 (or equal)
Liquid Filled:	Glycerin

2.4 COMPRESSED AIR STATIONS

NONE

2.5 PROGRAMMABLE LOGIC CONTROLLER (PLC)

NOT USED

2.6 CONTROL PANELS

None

PART 3 – EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

3.1.1 Installation

Install system components and appurtenances in accordance with the manufacturer's instructions and shall provide necessary interconnections, services, and adjustments required for a complete and operable system. Adjust or replace devices not conforming to the required accuracies. Factory sealed devices shall be replaced (rather than adjusted). Devices shall be installed in accordance with manufacturers' recommendations and as shown.

3.2 SOFTWARE INSTALLATION

NOT USED

3.3 MANUFACTURERS' FIELD SERVICES

NOT USED

3.4 FIELD TRAINING

NOT USED

END OF SECTION

SECTION 43 31 13

LIQUID PHASE GRANULAR ACTIVATED CARBON ADSORPTION SYSTEM

PART 1 – GENERAL

1.1 SCOPE OF WORK (SECTION DESCRIPTION)

A. Carbon Adsorption Hardware.

B. Granular Activated Carbon (GAC).

C. GAC System Supplier Services. Contractor shall utilize the services of the GAC system supplier as required during the installation, loading, startup, testing, and backwashing of the GAC units during operation.

D. Furnish all labor, materials, equipment and incidentals required to install the GAC System. This Section specifies the performance requirements for the design, fabrication, installation, and operation of the GAC system as shown on the contract drawings and as specified. The adsorption system consists of three carbon units and all related appurtenances required for an operational system.

E. Procurement, rigging, installation, carbon filling, startup, and disinfection of a temporary GAC system.

1.2 REFERENCES

A. ASME Section VIII, Division 1 – American Society of Mechanical Engineers Boiler and Pressure Vessel Code.

B. ASME/ANSI B16.5 – American Society of Mechanical Engineers/American National Standard Institute.

C. U.S. Food and Drug Administration, 21 CFR 175.300 and 177.2420.

D. Steel Structures Painting Council Surface preparation Specifications and National Association of Corrosion Engineers.

E. ASME Section II, American Society of Mechanical Engineers – Materials, Parts A, B & C.

F. American Society of Testing Materials (ASTM).

G. American Water Works Association (AWWA) – B604, Standard for Granular Activated Carbon.

H. ANSI/NSF Standard Drinking Water System Components – Health Effects.

1.3 SYSTEM DESCRIPTION

A. GAC System Supplier shall furnish the Carbon Adsorption Systems described herein (for installation by the contractor). The complete adsorption system shall include the following:

1. Carbon adsorbers with internals for carbon retention
2. NSF Approved Activated Carbon
3. Influent, effluent and backwash piping with valves

4. Carbon fill and discharge piping with valves
5. Vent and pressure relief piping
6. Water piping and utility connections
7. Accessories as shown below
8. Manufacturer's Services

B. The vessels, piping valves, and carbon functions as a system and shall be the end products of GAC System Supplier to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's services.

C. There shall be three carbon adsorption systems as delineated below:

System Number	Number of GAC vessels	Unit Flow Rate GPM	Pressure Drop – Normal Operation PSI	Pressure Drop Backwash Operation PSI
1	Three individual carbon units	700	7 – 10	15

D. Anticipated Inlet Characteristics

Compound	Units	Influent Concentration
Flow	gpm	700
pH	S.U.	4.9
Total Dissolved Solids	mg/l	70
Trichloroethylene (TCE)	μg/l	10
Iron	mg/l	1.2
Copper	mg/l	0.05
Lead	μg/l	2.3
Total hardness	mg/l	17
Calcium hardness	mg/l	10
Sulfate	mg/l	22
Turbidity	NTU	2.5

E. Outlet Characteristics

The GAC System shall be designed to meet the discharge limits given below:

Discharge Parameter	**Units**	**Limit**
Trichloroethylene	μg/L	<1
Arsenic	μg/L	<5

1.4 SUBMITTALS

A. Adsorber vessel data sheet and drawing including design pressure, dimensions, and capacity.

B. System flow diagram showing all valves, components, instrumentation and utilities.

C. System general arrangement showing dimensions, weights, and elevations including influent, effluent, backwash, and carbon exchange pipe connection locations.

D. Process flow diagrams and instrumentation diagrams(s) showing all major pieces of process equipment with controls (valves). Show on the drawings complete piping, wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and shall properly function as a unit. Also show proposed layout and anchorage of equipment and appurtenances; equipment relationship to other parts of the work; clearances for maintenance and operation; and shop and erection details, including cuts, copes, connections, holes, bolts, and welds.

E. Pressure drop information across the system. Demonstration of the total head loss through the carbon, adsorbers and appurtenant piping.

F. Specification of the granular activated carbon to be utilized in the system. Iodine number; isotherm and column test data. Design calculations indicating removals of each of the listed compounds in the carbon bed. Reports of testing granular activated carbon in accordance with AWWA B604. Material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) for activated carbon.

G. Manufacturer's certificates, including the name and address of the production facility, attesting that the activated carbon furnished meets the specified requirements.

H. Material specifications for pipe, fittings and instrumentation.

1. Specifications for vessel lining.
2. Specifications for vessel painting.

I. System Operating & Maintenance Manual shall be provided prior to shipment of the system – 4 copies.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Provide materials and equipment which are new and unused.

2.1.1 Standard Products

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Materials and equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

2.1.2 Nameplates

Adsorption shells shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.2 MEDIA

2.2.1 Activated Carbon

Material shall be NSF approved and free from impurities that affect the serviceability and appearance of the finished product. Activated carbon shall not require dosing or addition of a chemical mixture or solution to the water to be treated or to the water used for backwashing.

A. Twenty thousand (20,000) pounds of GAC shall be provided and installed within each adsorber vessel (60,000 pounds total).

B. The activated carbon shall be virgin, granular and manufactured from select grades of bituminous coal combined with suitable binders to provide a re-agglomerated granular product by a domestic (United States) manufacturing facility. Granules shall be clean and hard. The GAC shall conform to AWWA B604 (Potable Water Service) standard for GAC and comply with ANSI/NSF Standard 61. The activated carbon which is manufactured to the following specification:

Iodine Number, mg/g (minimum) (ASTM D 4607):	900
Moisture as packed, wt% (maximum):	2
Abrasion Number (Ro-Tap), (minimum):	78
Effective Size, mm:	0.8 to 1.0
Uniformity Coefficient, (maximum):	2.1
Trace Capacity Number	9
U.S. Sieve Series	
Percent Remaining on 8 mesh (maximum):	15
Percent Passing 30 mesh (maximum):	4
Typical Properties:	
Ash, wt%:	8
Apparent Density, g/cc (ASTM D 2854):	0.56
Water Soluble Ash, wt%:	<1%
Non-Wettable, wt%:	<1%

C. An analysis sheet certifying compliance with the specifications, and indicating point of manufacture shall accompany the delivered activated carbon.

2.3 ADSORPTION BATTERY COMPONENTS

Adsorption battery shall consist of three units. Performance specified shall refer to each unit and not to the battery as a whole.

2.3.1 Head Loss

Head loss in each unit at rated flow shall not exceed 7 psig when filled with fresh media.

2.3.2 Adsorption Shell - Modular units

A. The carbon adsorber vessels shall be Modular Carbon Adsorption System Vessels, as designed by GAC System Supplier, meeting these specifications. Modular units shall be acceptable under AWWA B605.

B. The carbon adsorber vessels shall be fabricated of carbon steel, conforming to ASTM A516 grade 70, 10'-0" diameter by 12'-0" straight side height with 2:1 elliptical to and bottom heads. The vessels shall be designed, constructed and stamped in accordance with ASME Section VIII, Division 1 and registered with the National Board for a design pressure rating of 125 psig at 140 °F. Each vessel shall be provided with one (1) 20" diameter round manway located on the lower straight side portion of the vessel and one 14" x18" elliptical manway located on the bottom head. The vessels shall be free standing vessels with four (4) structural steel support legs.

C. The structural aspects of the vessel shall be sufficient to meet the UBC requirements for seismic Zone 4. GAC System Supplier shall submit detailed calculations on request illustrating the seismic characteristics of the proposed vessel.

D. Each vessel shall be equipped with an internal cone bottom (45° angle) underdrain system equipped with polypropylene (ppl) underdrain nozzles to provide a minimum of one (1) nozzle for every nominal square foot of vessel cross section.

E. All surfaces shall be degreased prior to sandblasting. The adsorber internal surface that will be lined shall be blasted to a white metal surface (SSPC-SP5) to provide a 3 to 4 mil anchor pattern. The exterior of the adsorber shall be power tool cleaned to the degree specified by SSPC-SP3-63.

F. The interior surfaces of each vessel shall be lined with a nominal 35 to 45 mil dry film thickness (dft) using Carboline's Plasite 4110 series vinyl ester lining materials. The interior surfaces under the internal cone bottom shall also be lined with 10 to 12 mil dft using Carboline's Plasite "4000 series" vinyl ester lining materials. Plasite "4000 series" materials shall meet the requirements of the U. S. Federal Register, Food and Drug Regulations Title 21, Chapter 1, Paragraph 175.300.

G. The exterior surface of the adsorbers shall be painted to a dry film thickness of 5 to 7 mil with an high solids epoxy (gray color) paint material using Sherwin Williams 646 Macropoxy or equal.

H. Bolts and attaching hardware shall be stainless steel, conforming with ASTM F 593.

2.4 Process and Utility Piping

A. GAC system supplier shall be responsible to furnish three sets of GAC units and piping and valves for operating the units in parallel. Additionally, each of the units can be individually backwashed with treated water. One flow meter (with totalizer) shall be provided on each of the GAC feed lines to monitor flow and a differential pressure gauge shall be installed across the three units on the common manifold to measure the differential pressure across the three units.

B. The process and utility piping on the adsorption system shall include influent water to the system, treated water, backwash supply and discharge, adsorber vent lines and granular activated carbon fill and discharge piping.

C. Process piping (influent, effluent and backwash) shall be 8" diameter, constructed of schedule 40 carbon steel, ASTM A53 Grade B materials with 125# ASTM A126 Class B cast iron flanged fittings.

D. Vent piping shall be 3" diameter, constructed of schedule 40 carbon steel, ASTM A53 Grade B materials.

E. Carbon fill piping shall be 4” diameter, constructed of schedule 40 carbon steel, ASTM A53 Grade B materials.

F. Carbon discharge piping shall be 4” diameter, constructed of schedule 40 polypropylene lined carbon steel, ASTM 53 Grade B materials with ppl lined flanged fittings.

G. Utility piping shall be constructed of threaded schedule 80 carbon steel, ASTM 53 Grade B materials.

H. All piping surfaces shall be power tool cleaned to the degree specified by SSPC-SP3-63.

I. The exterior surface of the piping shall be painted to a dry film thickness of 5 to 7 mil with a high solids epoxy (gray color) paint material prior to assembly to ensure minimum oxidation at flanged connections.

J. The piping network shall be provided with a structural steel support frame for support of the piping, valves, and flow meters module.

2.5 Valves

A. The process and utility piping; excluding GAC fill and discharge piping shall be equipped with butterfly valves for flow control. Each of the units shall have valves on the influent, effluent and backwash connections adequate to allow the unit to be taken out of service to backwash or change out the activated carbon in the unit without affecting the operation of the other units.

B. The influent, effluent, and backwash control valves shall be a cast iron wafer type body butterfly valve with aluminum-bronze disc, BUNA-N seats and stainless steel shaft to mate to 150 pound ANSI flanges. The valves shall be rated for 200 psig in closed position at 180 °F, and meet or exceed section 5.0 of AWWA specification C-504-87.

C. The carbon fill and discharge valves shall be 4” diameter full port ball valves, 316 stainless steel construction with TFE seats and seals. A total of four (4) valves shall be supplied, two (2) for carbon fill and two (2) for carbon discharge.

D. Utility valves for the compressed air supply shall be bronze or brass or barstock brass body regular port ball valves.

2.6 Instrumentation

A. Pressure relief at each vessel shall be provided by a 3” rupture disk constructed of impervious graphite and designed to relieve pressure at the MAWP of the vessel. The rupture disks shall be mounted off the vessel vent line. A total of two (2) shall be provided for the system.

2.7 Miscellaneous

A. The carbon fill and discharge shall be fitted with hose connections, such that carbon transfer to and from the adsorbers can be facilitated using carbon transfer hoses. These connectors shall be 4” Quick Disconnect Adaptors constructed of corrosion resistant materials (nylon) as manufactured by Dover Corp. as Kamlock connectors or equal.

B. Two (2) flush connections shall be provided on each GAC fill line, one upstream and one downstream of the valve. One (1) flush connection shall be provided on each GAC discharge line, downstream of the valve. The connections shall be welded into the steel or stainless steel pipe or screwed into solid propylene “spacers” for the lined pipe. Flush

connections shall consist of a short section of ¾" pipe, a ¾" full port ball valve and a ¾" quick disconnect adaptor to match with water hose fittings.

PART 3 – EXECUTION

Work associated with a fully functional system including:

A. Procurement, rigging, installation, carbon filling, startup, and disinfection.

B. After installation of the GAC vessels, the contractor shall load (fill/transfer) each GAC vessel with virgin GAC. The contractor shall provide all related equipment for the carbon fill to each GAC unit including utilities such as air. Contractor shall be aware that there is **no** plant air available at the facility. Contractor shall assume that 10,000 gallons of water will be required per GAC unit for initially backwashing the carbon units for GAC segregation prior to placing the units in service.

C. Disinfection of GAC using sodium hydroxide solution as required (See Paragraph 3.5 below).

D. Disposal of waste during the startup and placement of the units in service including disinfection waste, backwash waste generated during backwash of the units to segregate the carbon prior to startup, and all other related wastes. This shall also include all disposal work including metering waste, neutralizing waste, and disposal of the wastewater to the sewer including any sampling.

E. Services relates to testing of treated water and proving out GAC's effectiveness, related temporary storage tanks, sampling and analytical work.

F. The units are expected to be in operation for seven months (spring-summer-fall). The Contractor shall also provide labor and equipment for periodic backwashing of units during its operation. Assume there will be four backwashes during the operation of the units.

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 EQUIPMENT INSTALLATION

Each adsorber shell or tank shall be anchored to a footing. Anchor bolts shall be provided to hold the shell to anchors in the footing.

3.3 PAINTING

All ferrous surfaces shall be coated or painted.

3.3.1 Touch-Up Painting

Factory painted items shall be touched up as needed. Factory painted items requiring touching up in the field shall be thoroughly cleaned of all foreign material, primed and top-coated with the manufacturer's standard factory finish.

3.4 TESTS

All products shall be carefully inspected for defects in workmanship and material; debris and foreign matter shall be cleaned out of valve openings and seats; all operating mechanisms shall be operated to check their proper functioning; and all nuts and bolts shall be checked for tightness. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced.

3.4.1 Hydrostatic Tests

After installation, all tanks shall be tested for water tightness. Testing plugs or caps, all necessary pressure pumps, pipe connections, gauges, other equipment, and all labor required shall be included. Test pressures shall be 125 psi for 1 hour. Piping systems shall be isolated from the tanks for pressure testing at the specified test pressures.

3.4.2 Performance Tests

An Operating Performance Test shall be performed to demonstrate that the completely installed Granular Activated Carbon Adsorber System conforms to the requirements of this specification. The performance test shall be performed for a few days which shall be determined at a later date. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing. The services of an equipment Manufacturer's representative shall be furnished to supervise test runs of the equipment.

3.4.3 Liquid Sampling and Analyses

Influent and effluent samples shall be collected, marked, preserved and analyzed.

3.4.3 Remedy

If the Installation Inspection or Operating Performance Test reveals deficiencies, corrective measures shall be taken until the Granular Activated Carbon Adsorber System satisfies all of the specified requirements.

3.5 DISINFECTION PROCEDURE

3.5.1 Disinfection

1. Take an adsorber off-line and make sure that a line on top of the adsorber is open to serve as a vent.

2. Drain the water from the adsorber through the adsorber effluent line.

3. Pump a 5% sodium hydroxide solution into the adsorber through the effluent line, the required volume is 7,000 gallons. See step 9a for an alternate procedure.

4. Stop pumping when the NaOH solution overflows through the vent line.

5. Allow the carbon to soak in the sodium hydroxide for at least four hours.

6. Drain NaOH solution from the adsorber through the adsorber effluent line.

3.5.2 Neutralization

7. Wash carbon by adding contaminant-free or clean water through the effluent line for 7-10 hours at a flow of 1.3-3 gpm/ft^2 in order to wash out the residual sodium hydroxide and neutralize the carbon. The disinfection is then complete.

8a. An alternate, faster procedure for neutralizing the carbon includes acid treatment. After the sodium hydroxide solution is drained from the adsorber, pump 5 gallons of reagent grade hydrochloric acid (37% HCl) into the adsorber through the effluent line.

8b. Fill the adsorber with clean water by backfilling through the effluent line at 3-5 gpm/ ft^2 so as to thoroughly mix the content of the adsorber. Shut off the backfill water when it begins to overflow through the vent line.

8c. Allow the carbon to soak for 60 minutes, then drain the adsorber. Check the pH of the water, which should be in the range of 8 to 10.

8d. Wash the carbon by adding clean water through the effluent line at a rate of 1.3-3 gpm/ ft^2 until the pH of the effluent water matches the influent water or within desired pH range. Disinfection is then complete.

3.5.3 Alternate Disinfection Procedure

9a. After step 2, add – 1,000 gallons of clear water through the effluent line.

9b. After completing step 9a, pump the contents of two 55-gallon drums of 50% sodium hydroxide into the adsorber through the effluent line.

9c. Fill the adsorber with clean water by backfilling through the effluent line at 3-5 gpm/ ft^2 so as to thoroughly mix the contents of the adsorber.

9d. Shut off the backfill water when it begins to overflow through the vent line. Check the pH of the water exiting the vent line. It should be 13 or higher.

9e. Go to step 5.

3.6 MANUFACTURER'S SERVICES

Provide the services of a representative of the manufacturer who is experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installing, adjusting, and testing of equipment.

3.7 FIELD TRAINING

No field training is required.

3.8 OPTIONAL ACCESSORIES

Provide three (3) 2" side sample nozzles at each vessel for use with in-bed water sample probes. Sample probes consist of a stainless steel pipe with a stainless steel slotted nozzle to collect a water sample from within the carbon bed. The sample probe shall be inserted through a 2" flanged nozzle (flanged nozzle to assure adequate coverage of the internal lining); and shall be provided with a drop line and shutoff valve external to the adsorber.

3.9 SAFETY MESSAGE

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable Federal and State requirements.

END OF SECTION

MODIFICATIONS TO AQUA NEW YORK, INC. WATER TREATMENT FACILITY INTERIM EMERGENCY SEAMANS NECK ROAD NASSAU COUNTY, NEW YORK

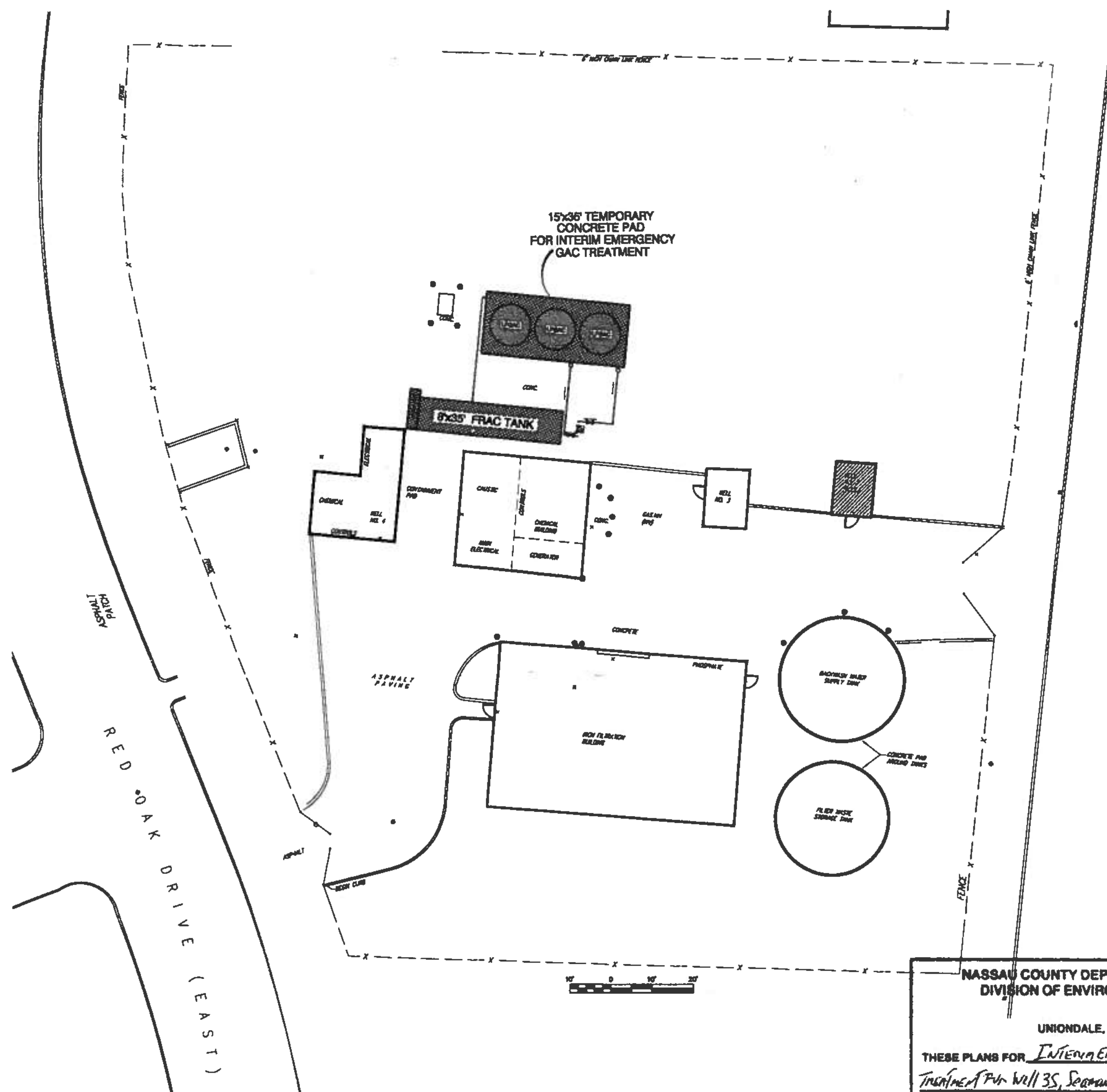
DRAWING LIST

GENERAL
G-1 COVER SHEET

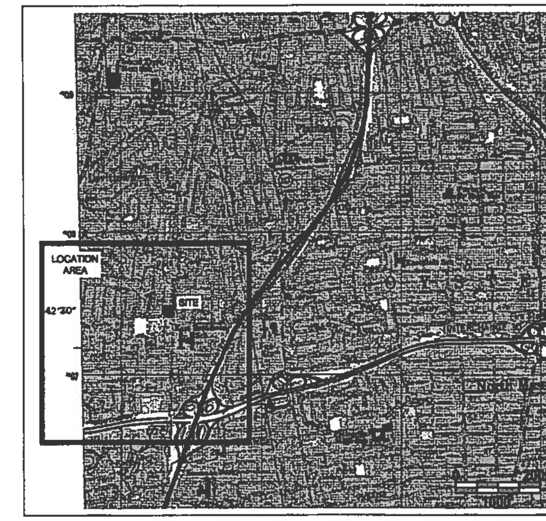
CIVIL
C-1 SITE PLAN
C-2 LPGAC PAD LOCATION PLAN

STRUCTURAL
S-1 LPGAC CONCRETE PAD DETAILS

PROCESS & MECHANICAL
PFD-1 PROCESS FLOW DIAGRAM
PID-1 P&ID-EXISTING SYSTEM TIE-IN
PID-2 P&ID
M-1 PIPING LAYOUT - PLAN VIEW
M-2 PIPING LAYOUT - ELEVATIONS
M-3 PIPING DETAILS



PROPERTY PLAN - 1"=20'



GENERAL VICINITY MAP - 1"=2000'
SOURCE: USGS - AMITYVILLE, NY - 7.5 MINUTE QUADRANGLE - 1994

SITE DATA:

1. PREPARED FOR: UNITED STATES NAVY
2. OWNER: AQUA AMERICA – NEW YORK
3. PROPERTY ADDRESS: 670 SEAMANS NECK ROAD LEVITTOWN, N.Y. 11783 TOWN OF HEMPSTEAD, NASSAU COUNTY, NEW YORK
4. TAX PARCEL NUMBER: BLOCK 403, SECTION 51, LOT 27 (FORMERLY LOT 8. SUBDIVIDED INTO LOTS 25 & 27. LOT 25 WAS TAKEN FOR ROAD WIDENING)
5. SCHOOL DISTRICT: LEVITTOWN SCHOOL DISTRICT
6. SOURCE OF TITLE: DEED BOOK 4725, PAGES 33–36
7. PARCEL AREA: 1.0705± ACRES (CALCULATED PER DEED)
8. ZONING: LEVITTOWN PLANNED RESIDENCE DISTRICT (LPRD).
9. SETBACKS: FRONT YARD: AVERAGE FRONT YARD DEPTH SIDE YARD: 20 FEET (OTHER THAN SINGLE FAMILY RESIDENCE) REAR YARD: 25 FEET
10. TOPOGRAPHY: TOPOGRAPHY IS BASED ON A FIELD SURVEY PERFORMED BY TETRA TECH ON SEPTEMBER 26–27, 2009, AN.
11. DATUM: HORIZONTAL=DEED, VERTICAL=NASSAU COUNTY SANITARY SEWER. BENCHMARK: SANITARY MANHOLE AT RED OAK DRIVE, RIM = 55.36. PROJECT BENCHMARK F.H.#3041 TOP NUT = 58.48.
12. BOUNDARY: BOUNDARY LINES SHOWN HEREIN ARE BASED ON A FIELD SURVEY CONDUCTED ON MARCH 17, 2011, PHYSICAL FIELD EVIDENCE, AERIAL PHOTOGRAPHS, RECORD DEED 4725, PAGE 33, AND AVAILABLE PLANS AND WAS BEST FIT TO THE EXISTING CONDITIONS.
13. SANITARY SEWER: NASSAU COUNTY SEWAGE DISPOSAL DISTRICT NO. 3.
14. UTILITIES: UTILITIES ARE SHOWN ACCORDING TO FIELD SURVEYED FOUND SURFACE EVIDENCE AND BEST AVAILABLE PLANS. ALL UTILITIES ARE APPROXIMATE AND MUST BE VERIFIED PRIOR TO COMMENCING EXCAVATION OPERATIONS.
15. FEMA: THIS SITE IN LOCATED ON THE FEMA FIRM PANEL 36059C0253–G. THE PANEL IS LISTED AS "PANEL NOT PRINTED – NO SPECIAL FLOOD HAZARD AREAS" ON FEMA FIRM INDEX MAP NUMBER 36059CIND1–B.
16. REFERENCE PLANS: "MAP SHOWING REAL PROPERTY TO BE ACQUIRED FOR THE ALTERATION OF ALIGNMENT OF SEAMANS NECK ROAD", SHEET 5 OF 9, PREPARED BY BRUIN & KING, DATED AUGUST 1962.

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH

UNIONDALE, N.Y. MARCH 16, 2012

THESE PLANS FOR Interim Emergency GAC VOC Remedy Treatment for Well 35, Seamans Neck Road, Aqua New York ARE HEREBY APPROVED SUBJECT TO THE PROVISIONS OF THE PERMIT ISSUED THIS DAY

[signature] P.E.
LOCAL PUBLIC HEALTH ENGINEER

SHEET 1 OF 9 PLAN No. 3438-11

CERTIFICATION REQUIRED
TO NASSAU COUNTY DEPARTMENT OF HEALTH BY PROFESSIONAL ENGINEER

UNAUTHORIZED ALTERATION OR ADDITION TO THIS PLAN IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, UNLESS THE PERSON IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. ANY PLAN ALTERATIONS BY ANOTHER ENGINEER MUST BE MARKED AS SUCH, INCLUDING THE SIGNATURE AND SEAL OF THE ALTERING ENGINEER.

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

SYM	DESCRIPTION	DATE	APPR
	SUBMITTED FOR BID	12/23/11	HKM
	PER NASSAU COUNTY DOH COMMENTS	3.5.12	

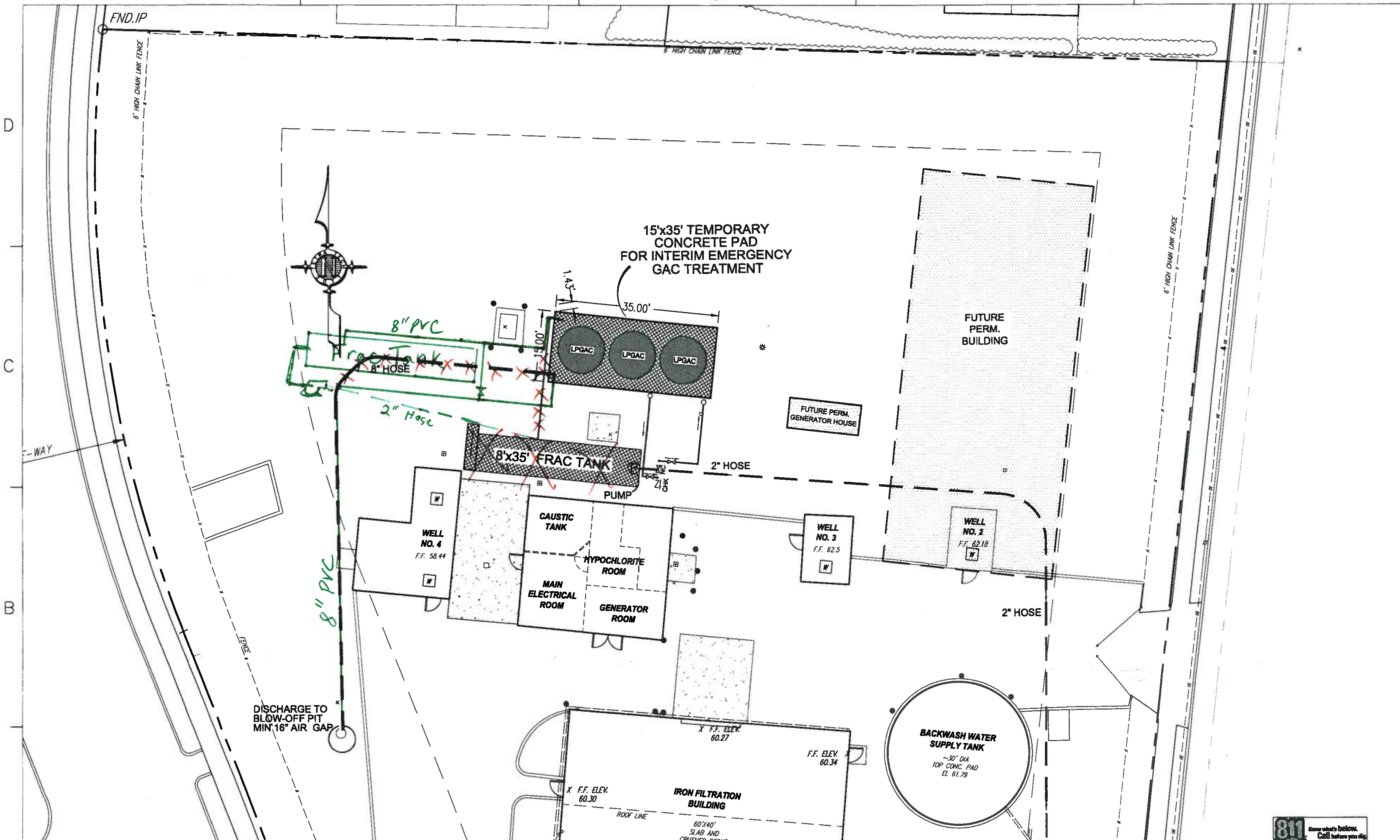
NAVFAC

STATE OF NEW YORK — DANIEL B. BLACK — 080336 — LICENSED PROFESSIONAL ENGINEER

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT — NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY — NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY
COVER SHEET

CODE ID. NO. 80091 SIZE D
MAXIMO NO. HS2470-08-0-1001
JOB ORDER NO. NE-25
CONSTR. CONTR. NO. 112G02019
G-1

REC'D MAR 08 2012 BY NCHD



811 Know what's below. Call before you dig.

UNDERGROUND UTILITIES DISCLAIMER: ACCURACY OF THE PROVIDED EXISTING UNDERGROUND UTILITY INFORMATION IS NOT GUARANTEED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXACT LOCATIONS.

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SYM	DESCRIPTION	DATE	APPR
	SUBMITTED FOR IRO	12/22/11	HKM
	PER NASSAU COUNTY DOH COMMENTS	3.5.12	

NAVFAC

Tt

DES HKM | DR BNL
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT — NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY — NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY

SITE PLAN

CODE ID. NO. 80091 | SIZE D
SCALE 1"=10'
NAVFAC NO. N62470-08-D-1001
JOB ORDER NO. NE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02019
NAVFAC DRAWING NO.
SHEET OF
C-1

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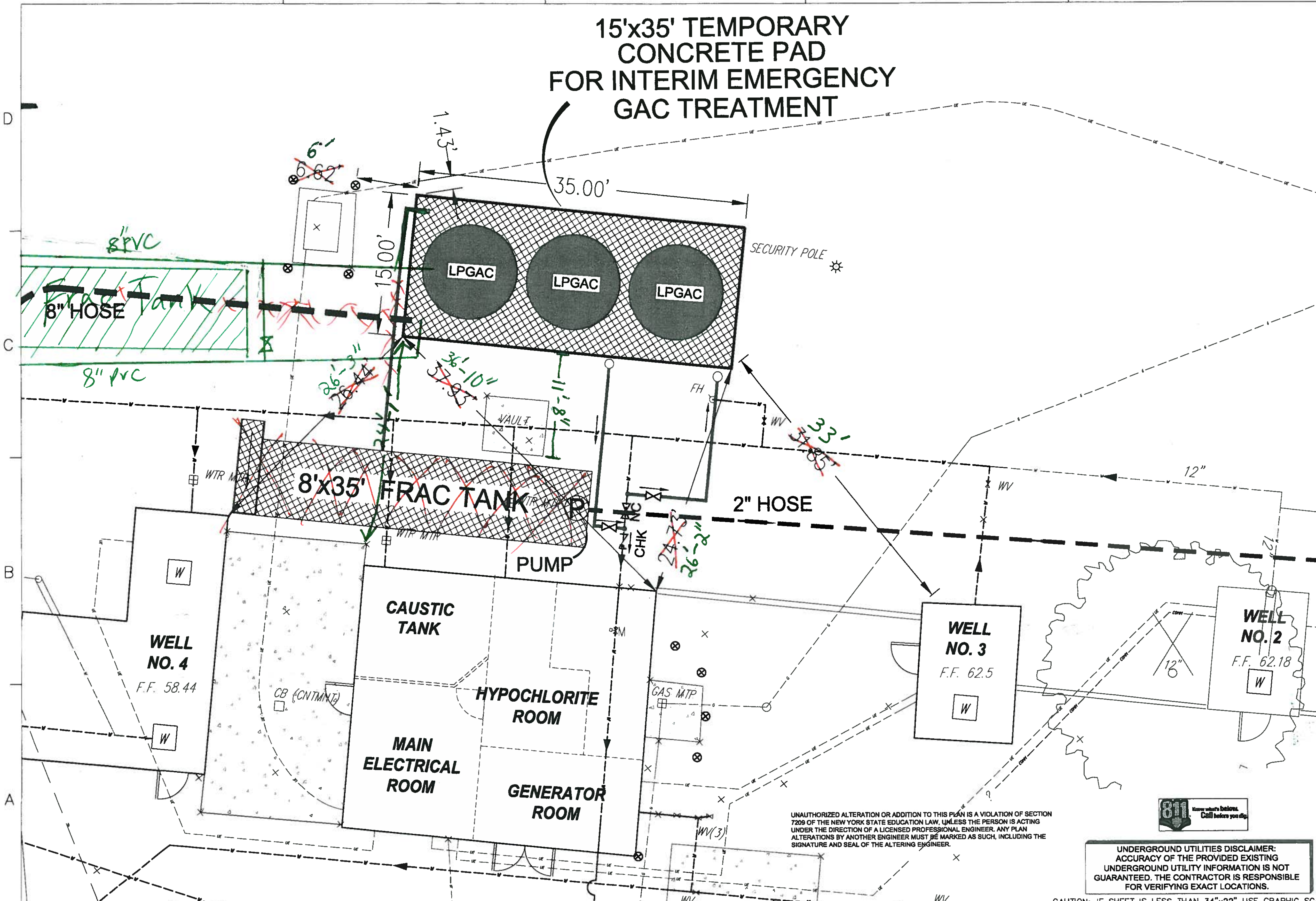
NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 2 OF 9
See first sheet hereof for date and signature

REC'D
MAR 08 2012
BY NCHD



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SUBMITTED FOR BID
PER NASSAU COUNTY DOH COMMENTS

NAVFAC

STATE OF NEW YORK — LICENSED PROFESSIONAL ENGINEER — 080336

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC — NAVAL STATION – NORFOLK, VIRGINIA — NORTHEAST IPT

AQUA NY — NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY

LPGAC PAD LOCATION PLAN

CONSTR. CONTR. NO. 112G02019

C-2

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 3 OF 9
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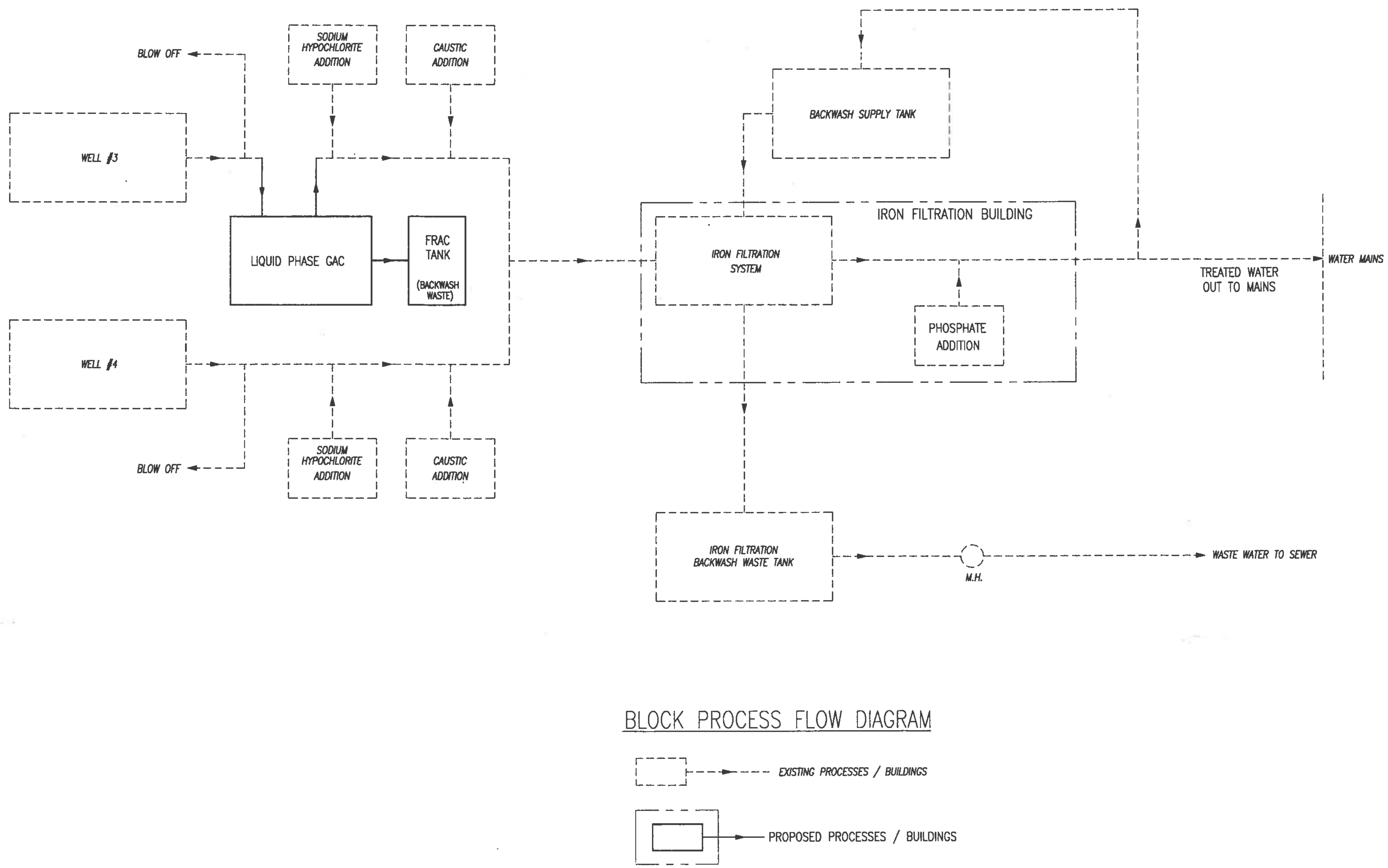

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SYM	DESCRIPTION	DATE	APPR
	SUBMITTED FOR BID	12/22/11	HKM
	PER NASSAU COUNTY DOH COMMENTS	3.5.12	

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DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT — NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY — NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY

PROCESS FLOW DIAGRAM

DES HKM | DR BML
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

CODE ID. NO. 80091 | SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONS'R CONTR. NO. 112G02019
NAVFAC DRAWING NO.
SHEET OF

PFD-1

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 4 OF 9
See first sheet hereof for date and signature

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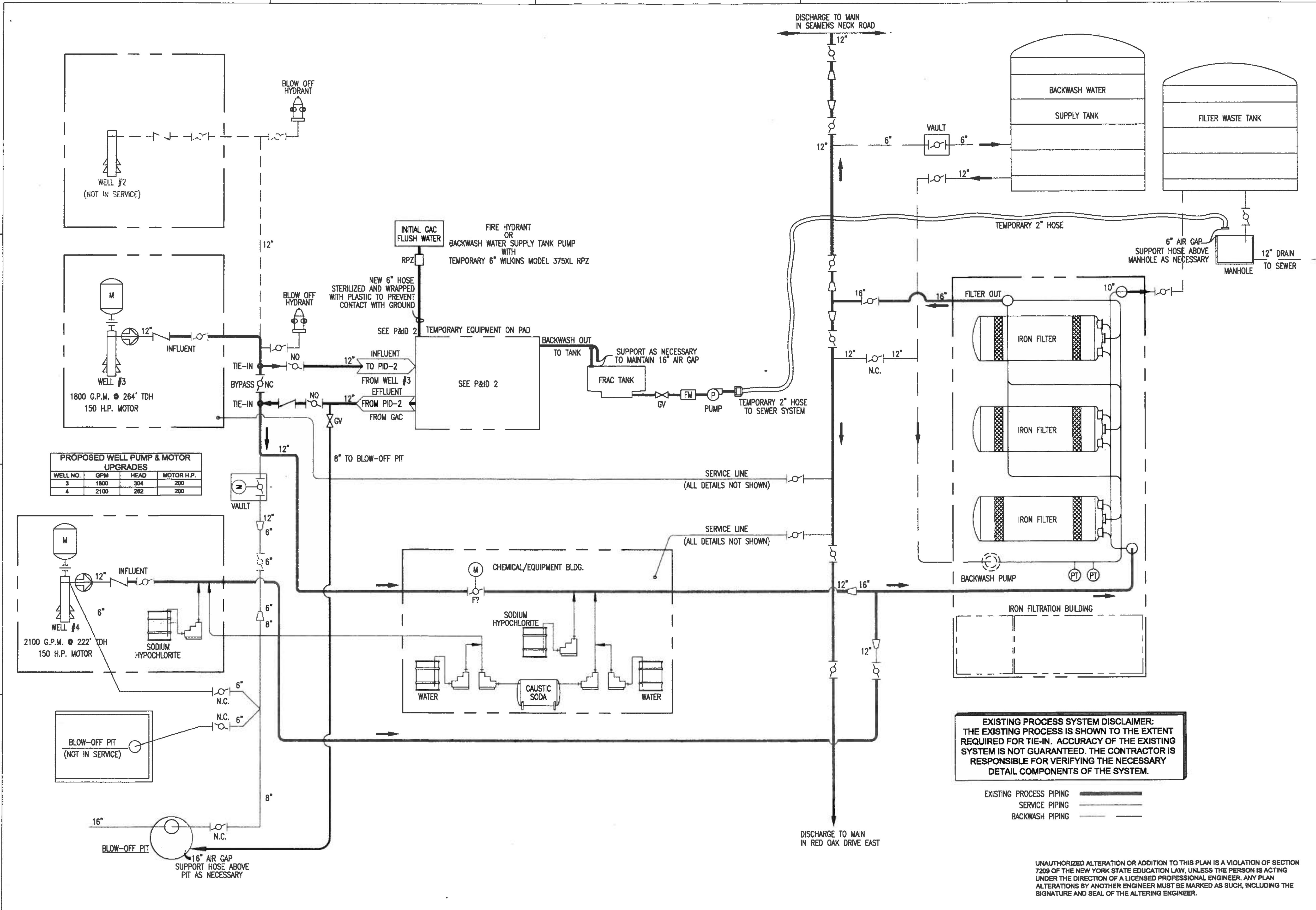

WELL #2
(NOT IN SERVICE)
BLOW OFF HYDRANT
12"
WELL #3
1800 G.P.M. @ 264' TDH
150 H.P. MOTOR
INFLUENT
TIE-IN
BYPASS
NC
NO
TIE-IN
GV
8" TO BLOW-OFF PIT
INITIAL GAC FLUSH WATER
RPZ
FIRE HYDRANT OR BACKWASH WATER SUPPLY TANK PUMP WITH TEMPORARY 6" WILKINS MODEL 375XL RPZ
NEW 6" HOSE STERILIZED AND WRAPPED WITH PLASTIC TO PREVENT CONTACT WITH GROUND
SEE P&ID 2
TEMPORARY EQUIPMENT ON PAD
INFLUENT TO PID-2 FROM WELL #3
EFFLUENT FROM PID-2 FROM GAC
SEE P&ID 2
BACKWASH OUT TO TANK
SUPPORT AS NECESSARY TO MAINTAIN 16" AIR GAP
FRAC TANK
FM
PUMP
TEMPORARY 2" HOSE TO SEWER SYSTEM
DISCHARGE TO MAIN IN SEAMENS NECK ROAD
VAULT
BACKWASH WATER SUPPLY TANK
FILTER WASTE TANK
TEMPORARY 2" HOSE
6" AIR GAP SUPPORT HOSE ABOVE MANHOLE AS NECESSARY
MANHOLE
12" DRAIN TO SEWER
FILTER OUT
IRON FILTER
IRON FILTER
IRON FILTER
BACKWASH PUMP
PT
IRON FILTRATION BUILDING
N.C.
SERVICE LINE (ALL DETAILS NOT SHOWN)
SERVICE LINE (ALL DETAILS NOT SHOWN)
CHEMICAL/EQUIPMENT BLDG.
SODIUM HYPOCHLORITE
WATER
CAUSTIC SODA
WATER
WELL #4
2100 G.P.M. @ 222' TDH
150 H.P. MOTOR
SODIUM HYPOCHLORITE
BLOW-OFF PIT (NOT IN SERVICE)
BLOW-OFF PIT
16" AIR GAP SUPPORT HOSE ABOVE PIT AS NECESSARY
DISCHARGE TO MAIN IN RED OAK DRIVE EAST
EXISTING PROCESS PIPING
SERVICE PIPING
BACKWASH PIPING

PROPOSED WELL PUMP & MOTOR UPGRADES

WELL NO.	GPM	HEAD	MOTOR H.P.
3	1800	304	200
4	2100	282	200

EXISTING PROCESS SYSTEM DISCLAIMER:
THE EXISTING PROCESS IS SHOWN TO THE EXTENT REQUIRED FOR TIE-IN. ACCURACY OF THE EXISTING SYSTEM IS NOT GUARANTEED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE NECESSARY DETAIL COMPONENTS OF THE SYSTEM.

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CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

SYM	DESCRIPTION	DATE	APPR
	SUBMITTED FOR BID	12/23/11	HKM
	PER NASSAU COUNTY DOH COMMENTS	3.5.12	

NAVFAC

STATE OF NEW YORK · LICENSED PROFESSIONAL ENGINEER

DES HKM | DR BNL
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT — NAVAL STATION - NORFOLK, VIRGINIA
AQUA NY — NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY

P&ID - EXISTING SYSTEM TIE-IN

CODE ID. NO. 80091 | SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02019
NAVFAC DRAWING NO.
SHEET OF —

PID-1

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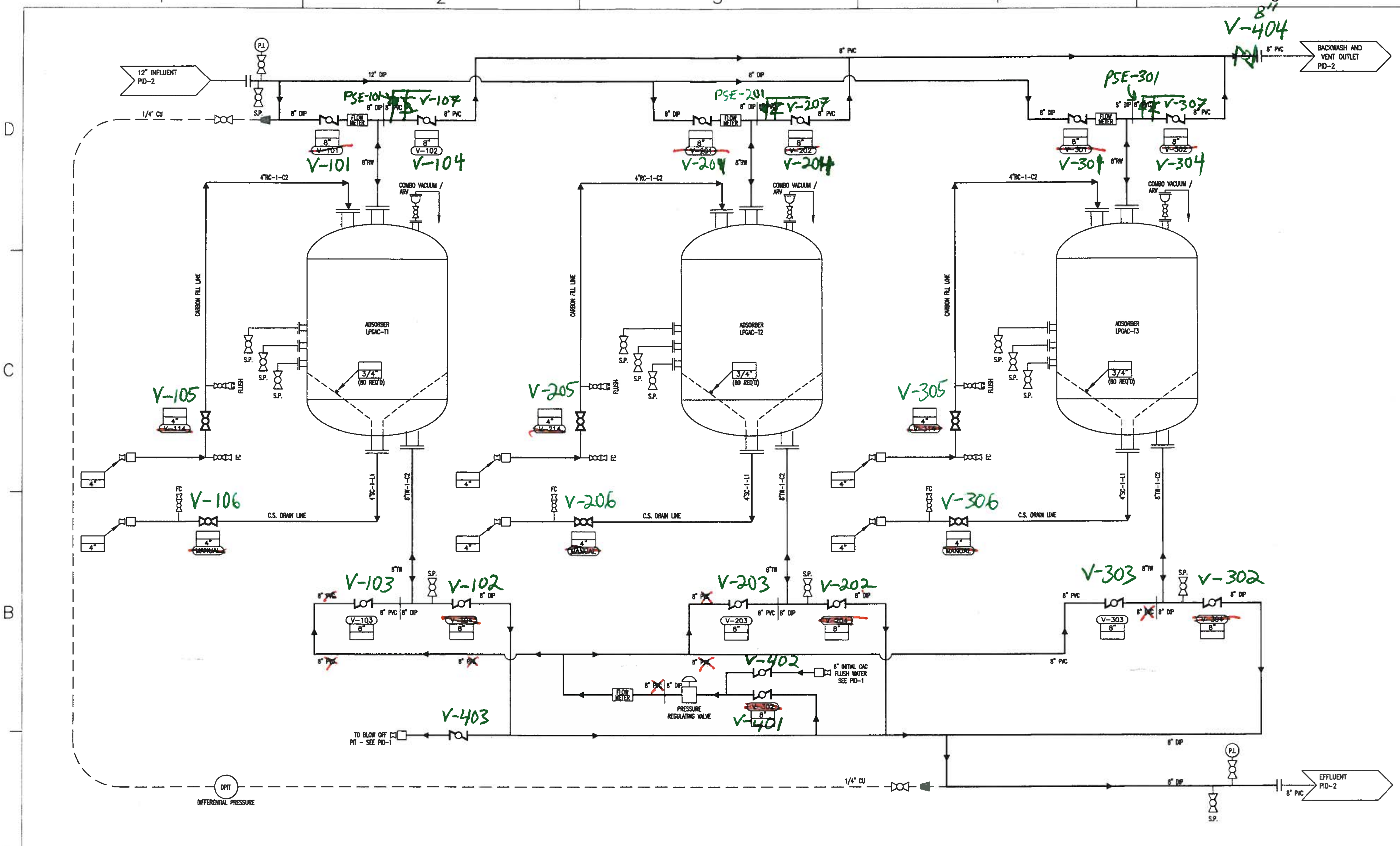
NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 5 OF 9
See first sheet hereof for date and signature

REC'D
MAR 08 2012
BY NCHD



LEGEND

BW - BACKWASH WATER
FC - FLUSH CONNECTION
RC - REACT.(OR VIRGIN) CARBON
RW - RAW WATER
SC - SPENT CARBON SLURRY
SP - SAMPLE PORT
TW - TREATED WATER
V - VENT
NC - NORMALLY CLOSED
PI - PRESSURE INDICATOR

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DATE	DESCRIPTION
12/23/11	SUBMITTED FOR BID
3.5.12	PER NASSAU COUNTY DOH COMMENTS

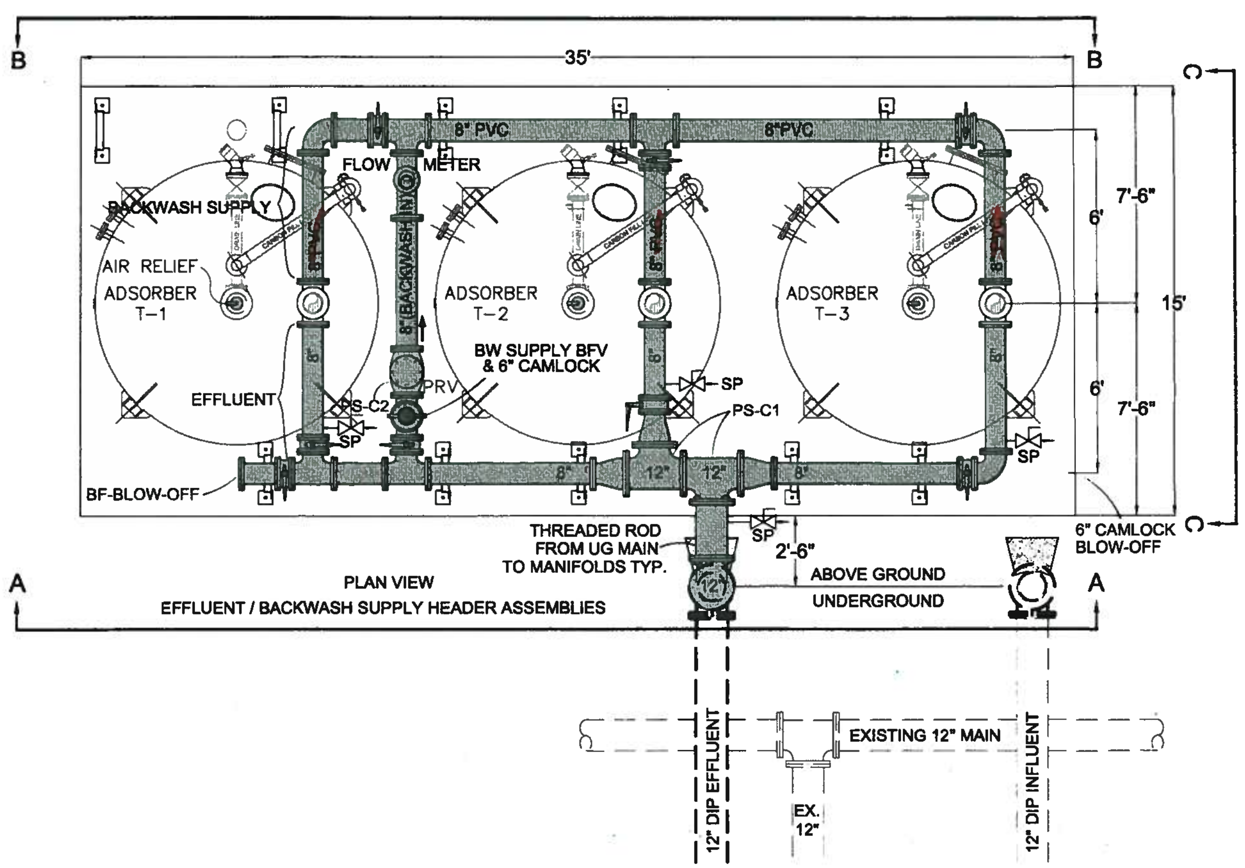
NAVFAC

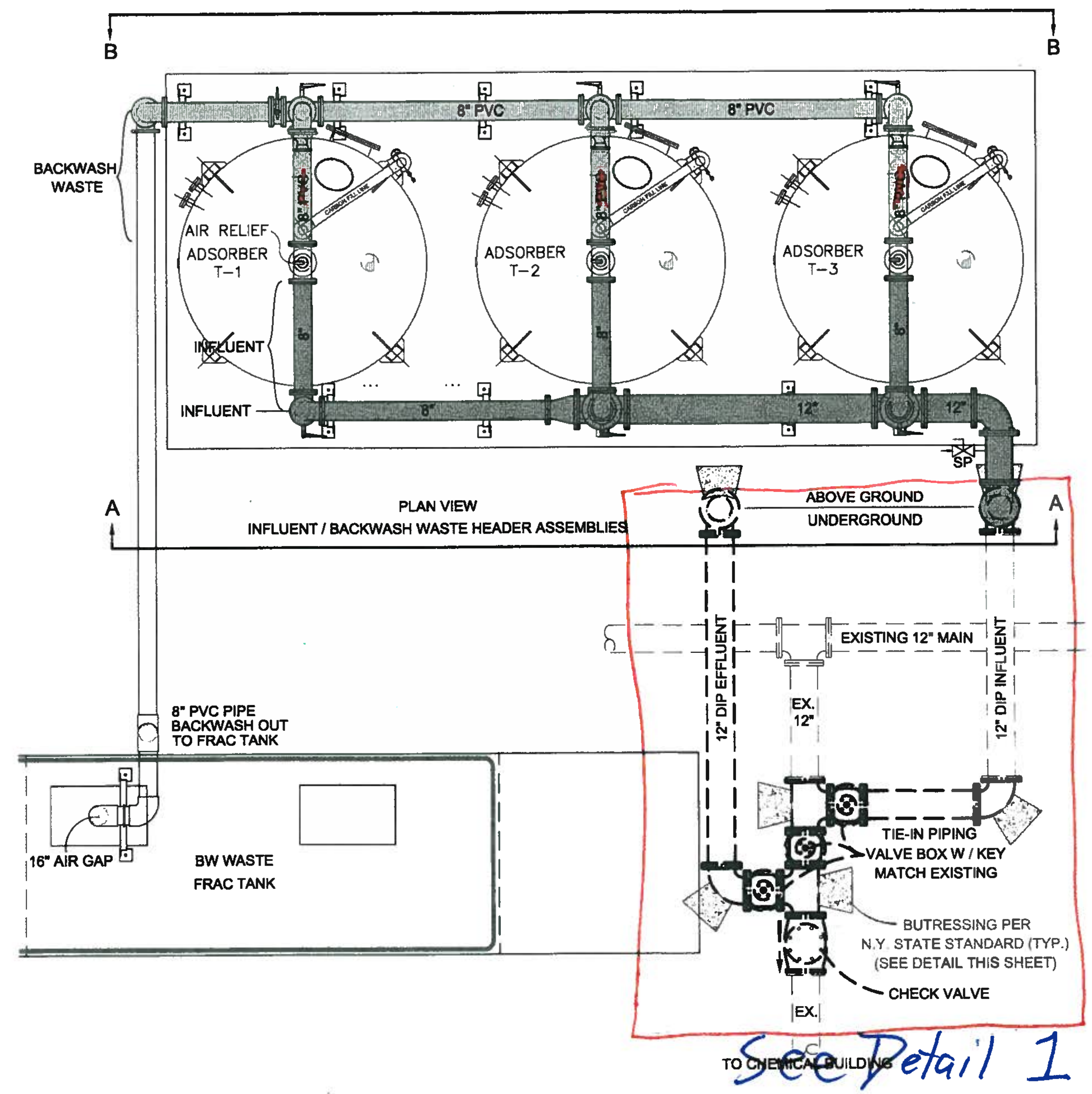
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT
NAVAL STATION - NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT FACILITY - INTERIM EMERGENCY
P&ID ADSORBER DETAIL

CONSTR. CONTR. NO. 112G02019
PID-2

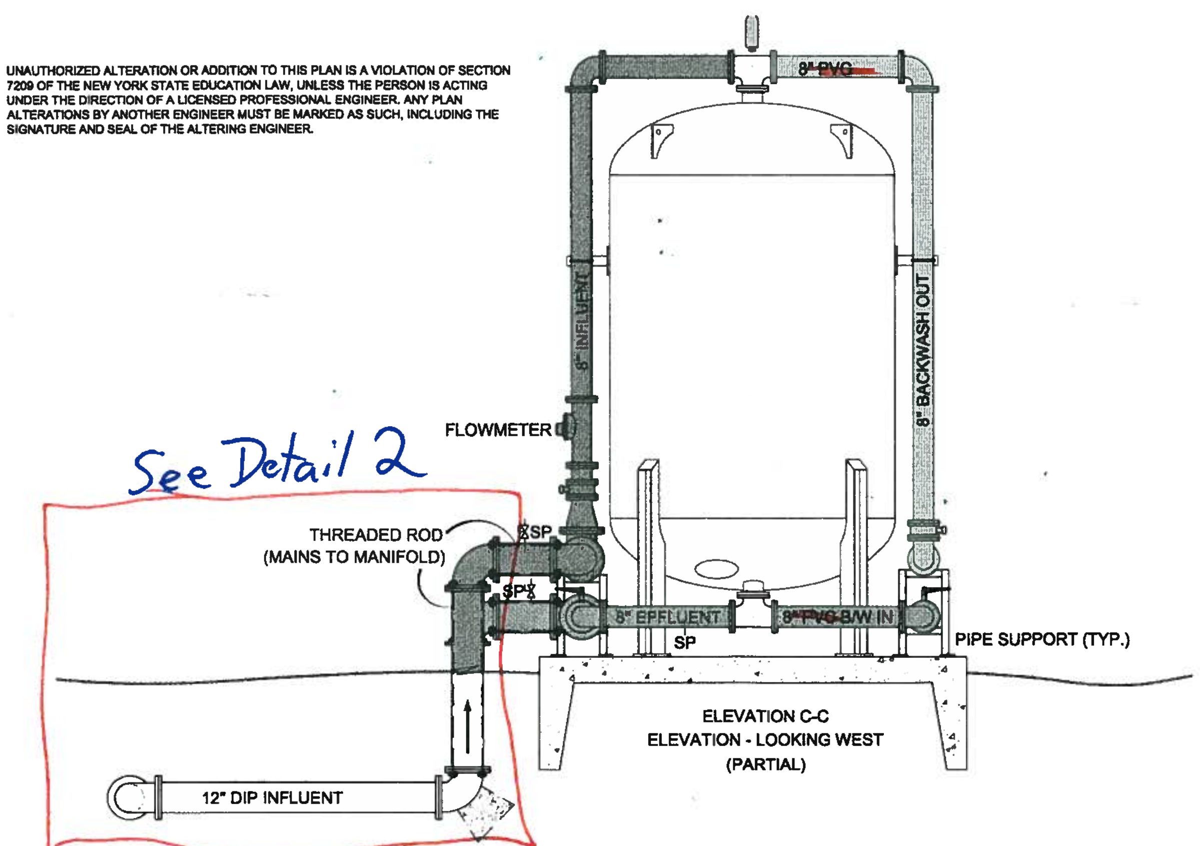
NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 6 OF 9
See first sheet hereof for date and signature

REC'D
MAR 08 2012
BY NCHD

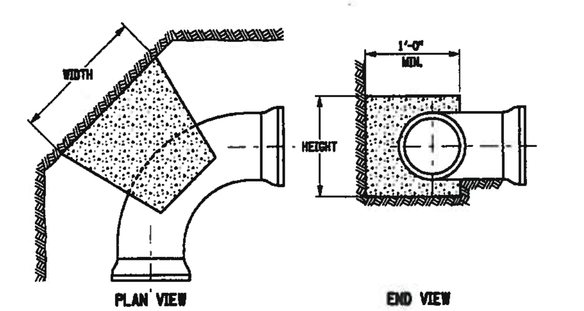




UNAUTHORIZED ALTERATION OR ADDITION TO THIS PLAN IS A VIOLATION OF SECTION 7209 OF THE NEW YORK STATE EDUCATION LAW, UNLESS THE PERSON IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. ANY PLAN ALTERATIONS BY ANOTHER ENGINEER MUST BE MARKED AS SUCH, INCLUDING THE SIGNATURE AND SEAL OF THE ALTERING ENGINEER.

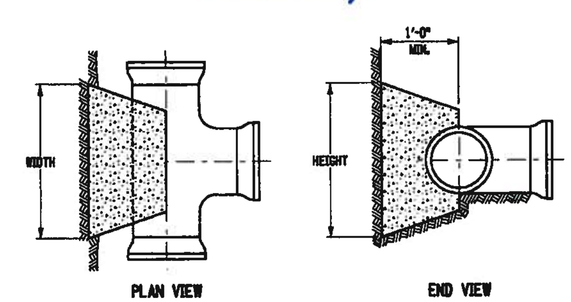


ELEVATION C-C
ELEVATION - LOOKING WEST
(PARTIAL)



PLAN VIEW — END VIEW

90° BEND THRUST BLOCK DIMENSIONING					
PIPE SIZE	WIDTH (FT-IN)	HEIGHT (FT-IN)	PIPE SIZE	WIDTH (FT-IN)	HEIGHT (FT-IN)
4 NPS	2'-3"	1'-3"	14 NPS	7'-3"	3'-6"
6 NPS	3'-3"	1'-6"	16 NPS	8'-3"	4'-0"
8 NPS	4'-3"	2'-3"	18 NPS	9'-3"	4'-6"
10 NPS	5'-3"	2'-6"	20 NPS	10'-6"	5'-0"
12 NPS	6'-0"	3'-3"	24 NPS	12'-6"	6'-0"



PLAN VIEW — END VIEW

TEE/DEAD END THRUST BLOCK DIMENSIONING					
PIPE SIZE	WIDTH (FT-IN)	HEIGHT (FT-IN)	PIPE SIZE	WIDTH (FT-IN)	HEIGHT (FT-IN)
4 NPS	2'-0"	1'-0"	14 NPS	5'-6"	3'-3"
6 NPS	3'-0"	1'-3"	16 NPS	6'-6"	3'-6"
8 NPS	3'-3"	2'-0"	18 NPS	7'-6"	4'-0"
10 NPS	4'-3"	2'-3"	20 NPS	8'-6"	4'-3"
12 NPS	5'-3"	2'-6"	24 NPS	10'-3"	5'-3"

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

SUBMITTED FOR BID
PER NASSAU COUNTY DOH COMMENTS

NAVFAC

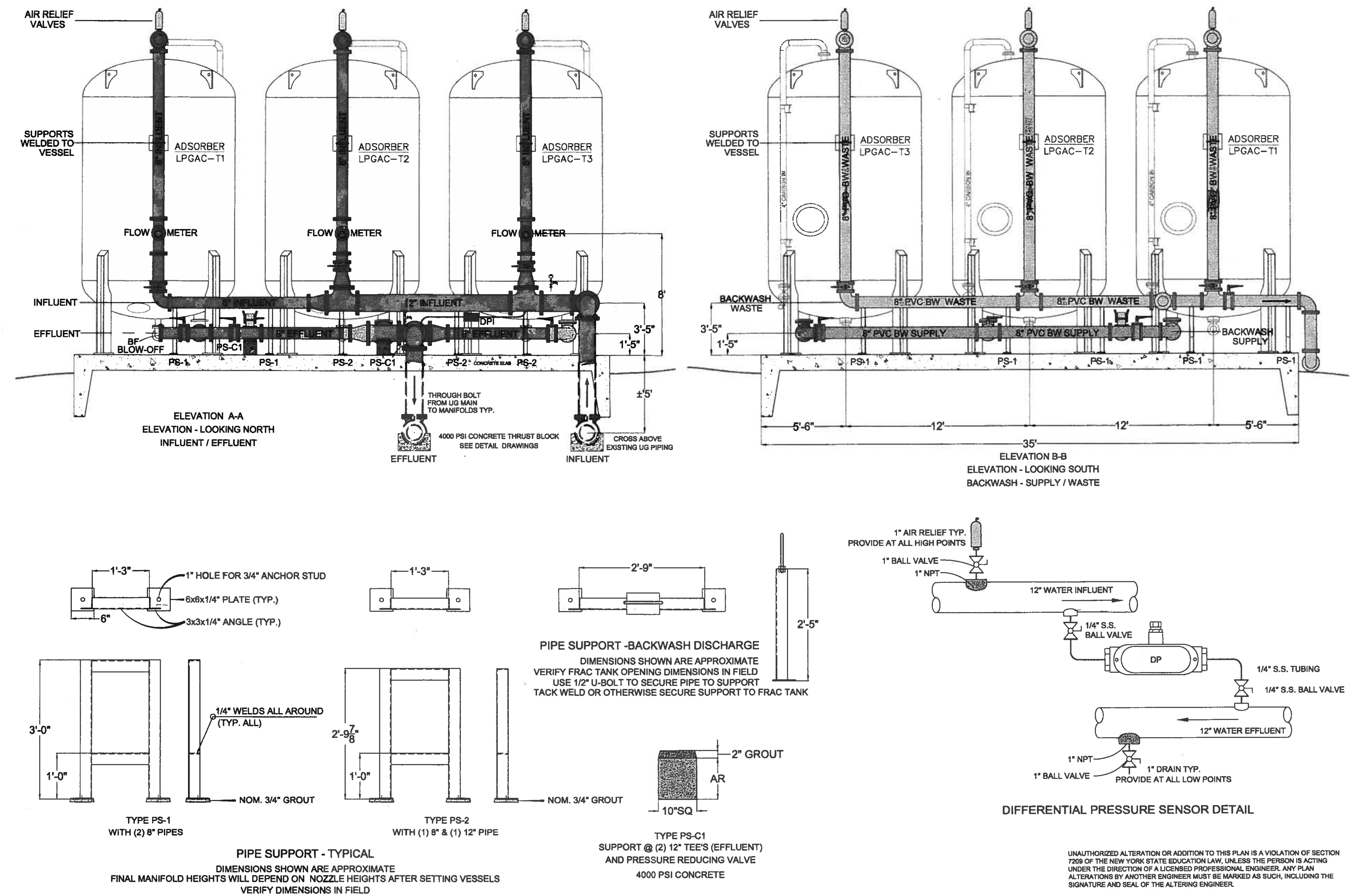
STATE OF NEW YORK — LICENSED PROFESSIONAL ENGINEER — 060734

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NAVAL STATION - NORFOLK, VIRGINIA
NORTHEAST IPT
AQUA NY — NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT FACILITY - INTERIM EMERGENCY

PIPING LAYOUT - PLAN VIEW

CONS'R CONTR. NO. 112G02019

M-1



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CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

SYM	DESCRIPTION	DATE	APPR
	SUBMITTED FOR BID	12/23/11	HKM
	PER NASSAU COUNTY DOH COMMENTS	3.5.12	

NAVFAC

Tt

STATE OF NEW YORK — DAVID DANIEL BAYBACK — 080836 — LICENSED PROFESSIONAL ENGINEER

DES HKM | DR BML
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT — NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY — NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY

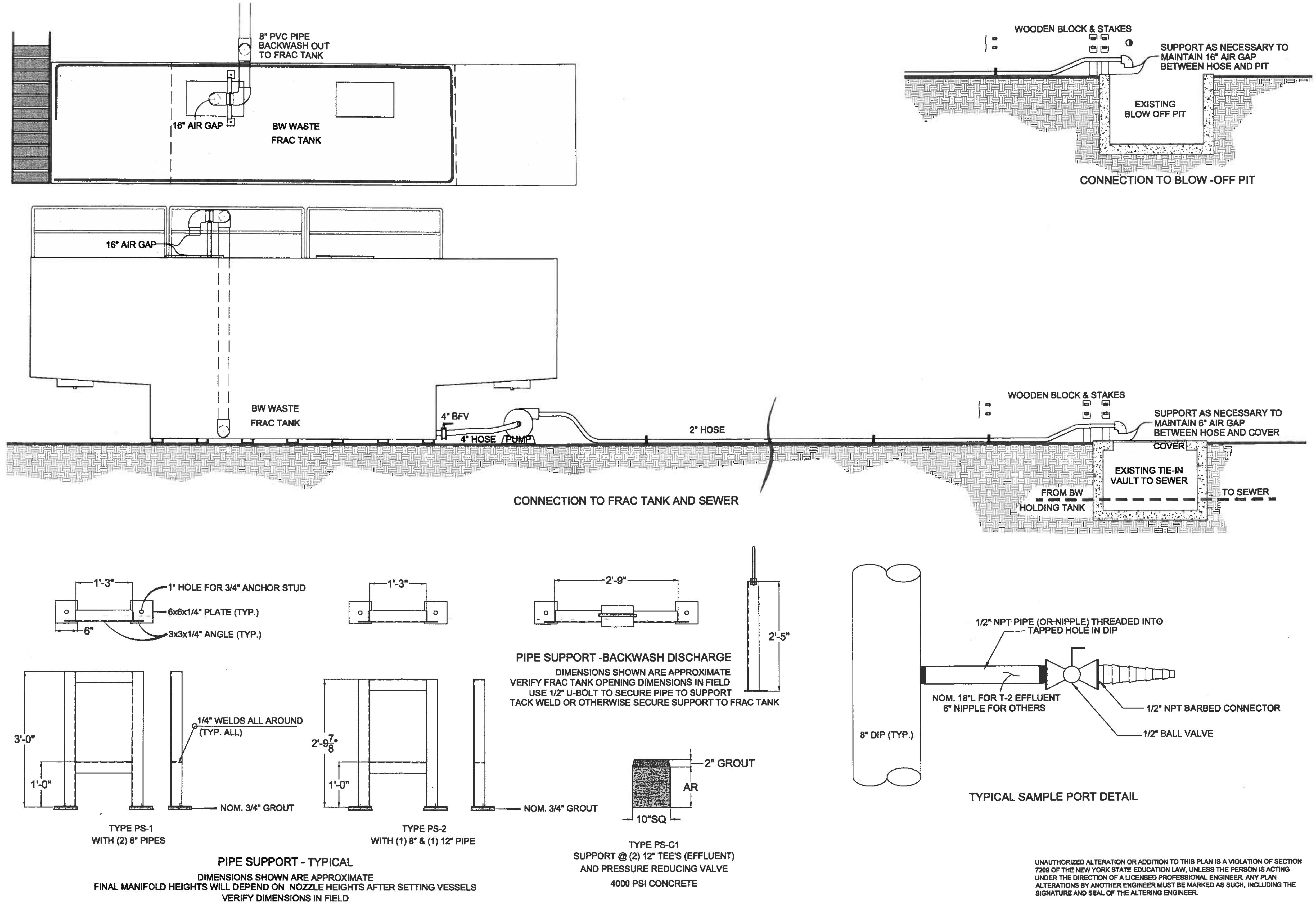
PIPING LAYOUT - ELEVATIONS

CODE ID. NO. 80091 | SIZE D
SCALE: NTS
MAXIMO NO. KS2470-08-0-1001
JOB ORDER NO. 9E-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02019
NAVFAC DRAWING NO.
SHEET OF —

M-2

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 8 OF 9
See first sheet hereof for date and signature

REC'D
MAR 08 2012
BY NCHD



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CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

SYM	DESCRIPTION	DATE	APPR
	SUBMITTED FOR BID	12/22/11	HKM
	PER NASSAU COUNTY DOH COMMENTS	3.5.12	

NAVFAC

DES HKM | DR BML
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT — NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY — NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT FACILITY – INTERIM EMERGENCY

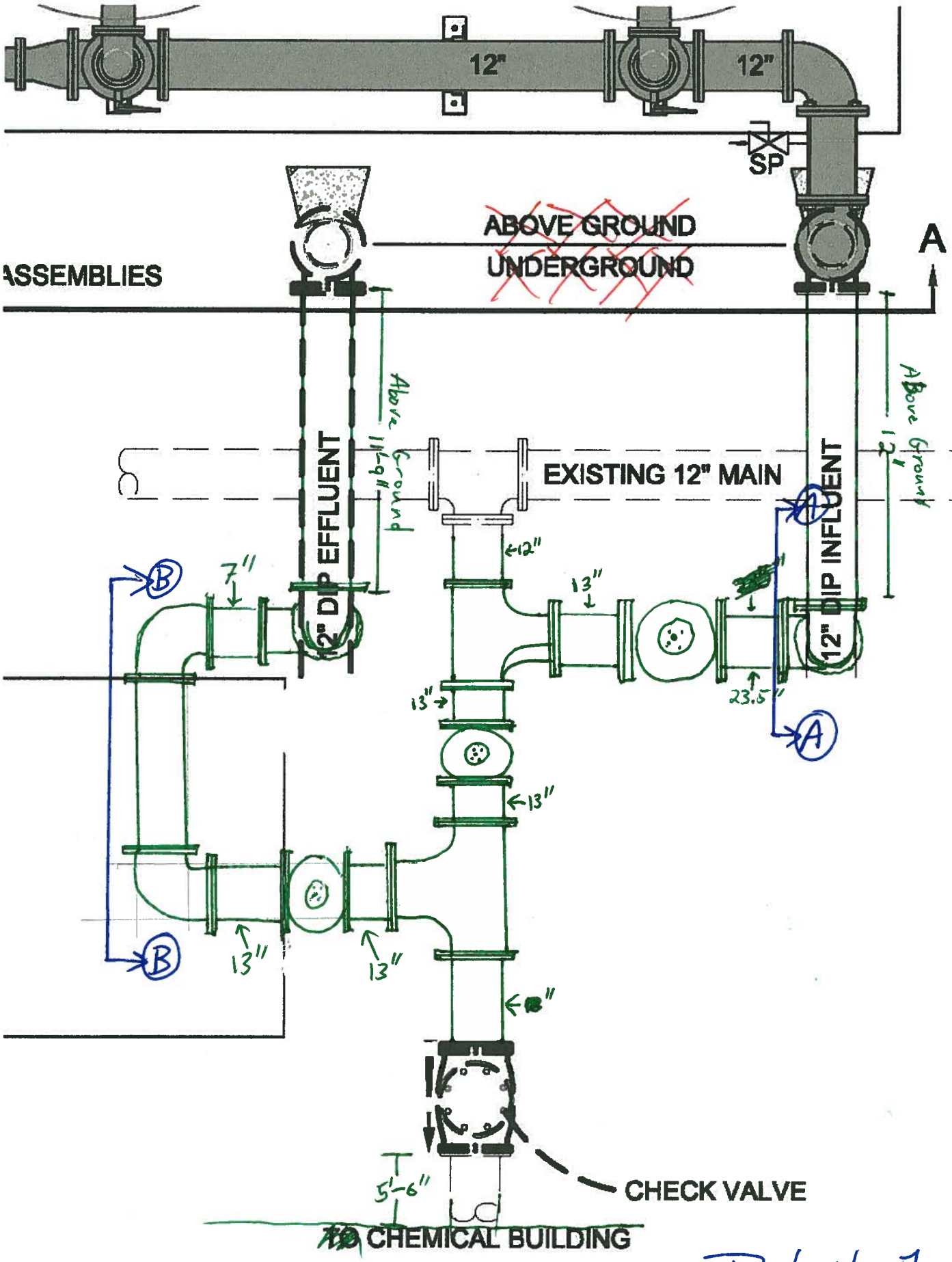
DETAILS

CODE ID. NO. 80091 | SIZE D
SCALE: NTS
NAVFAC NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02019
NAVFAC DRAWING NO.
SHEET OF —

M-3

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
These plans are hereby approved
SHEET 9 OF 9
See first sheet hereof for date and signature

REC'D
MAR 08 2012
BY NCHD

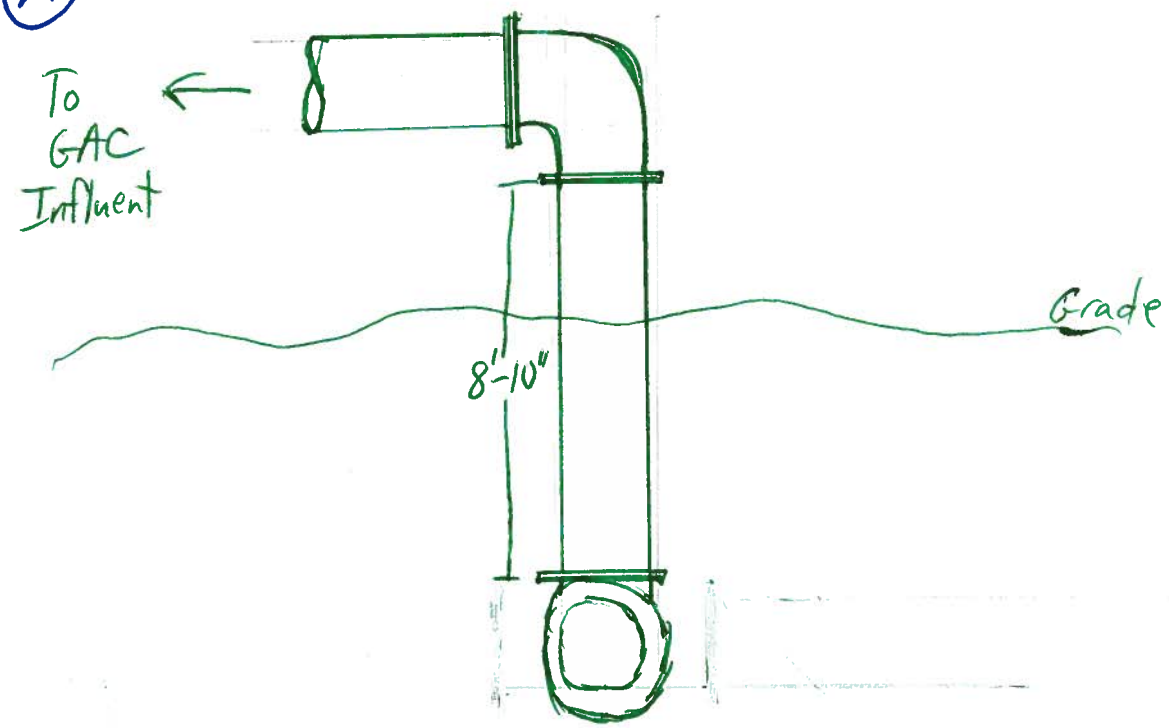


Detail 1

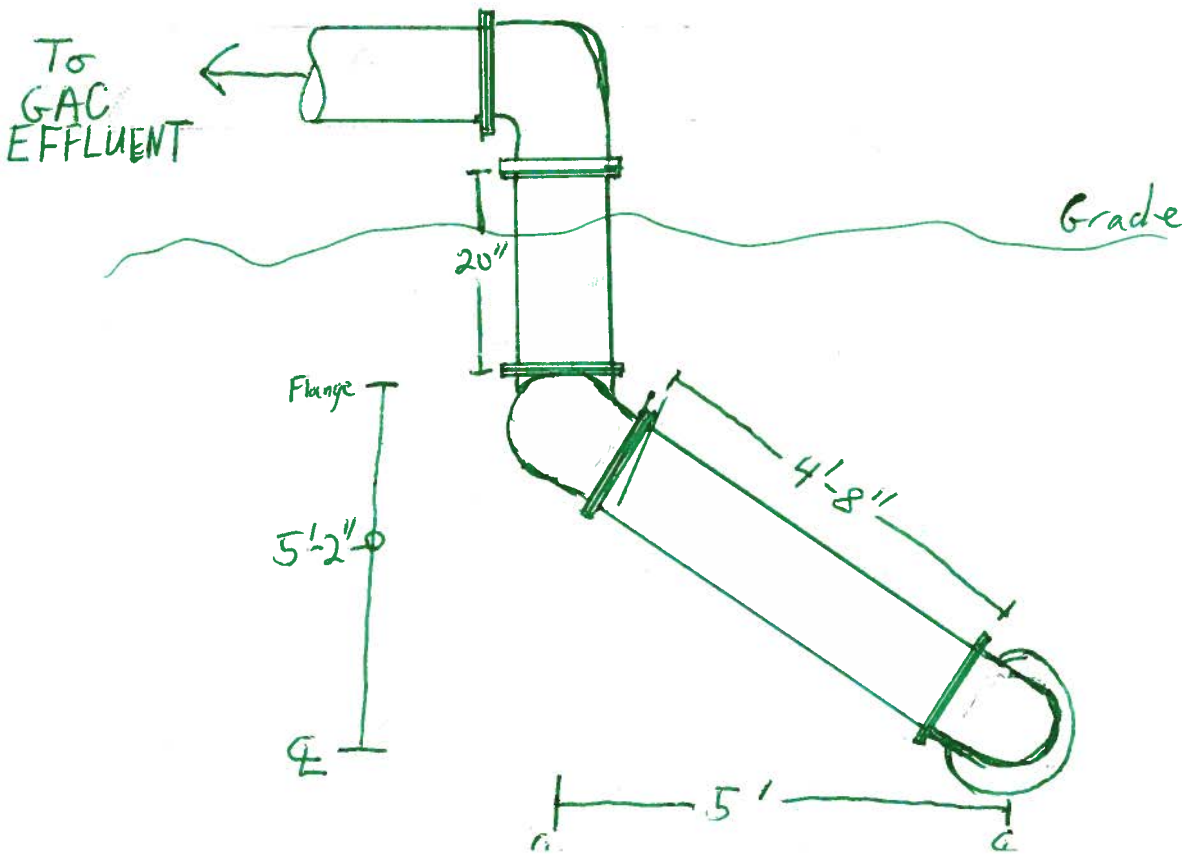
DES
REVIEWI
PM/DM
CHIEF E

NAVAL FACILITIES ENGINEERING COMMAND
COMMAND ~ MID-ATLANTIC

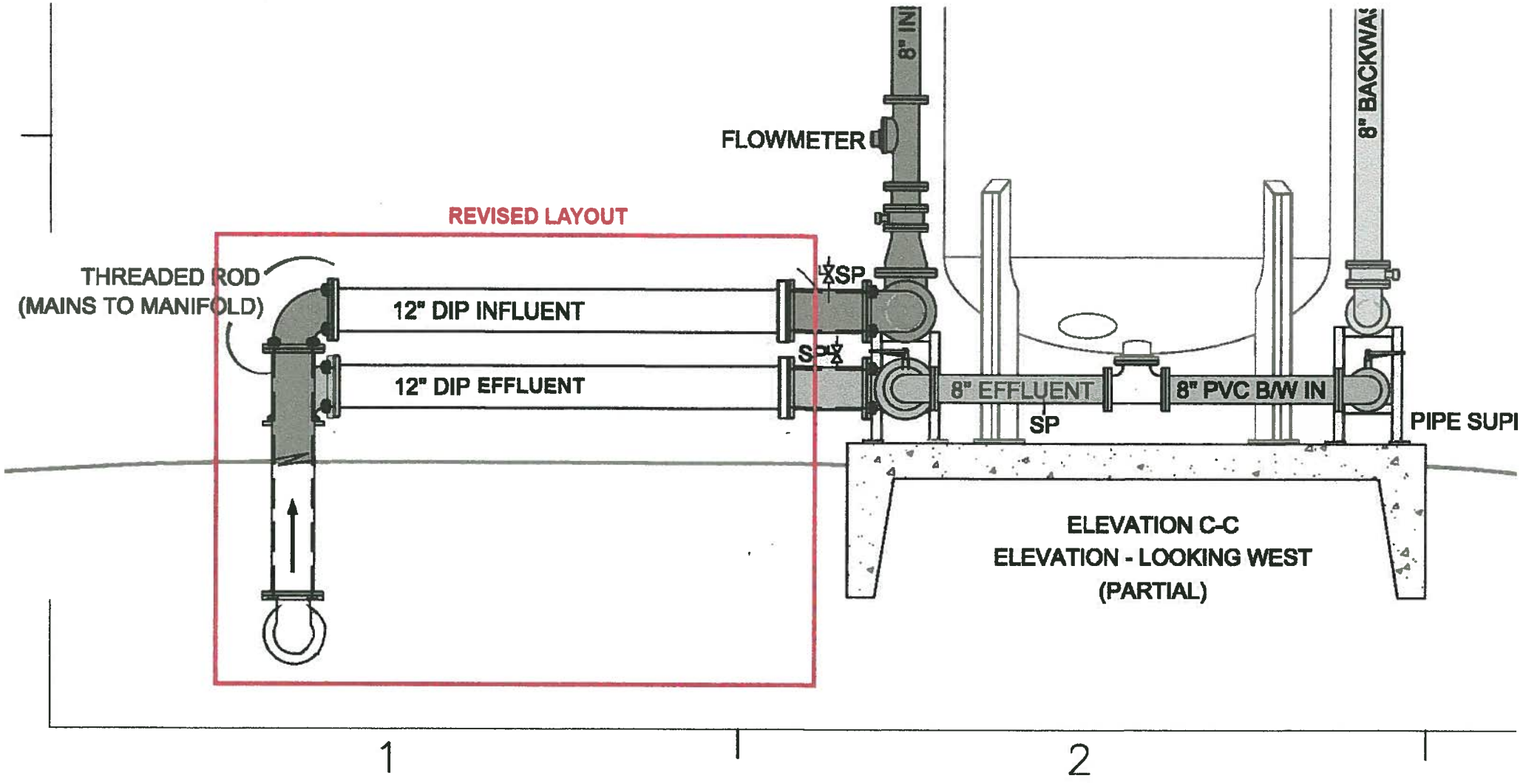
A

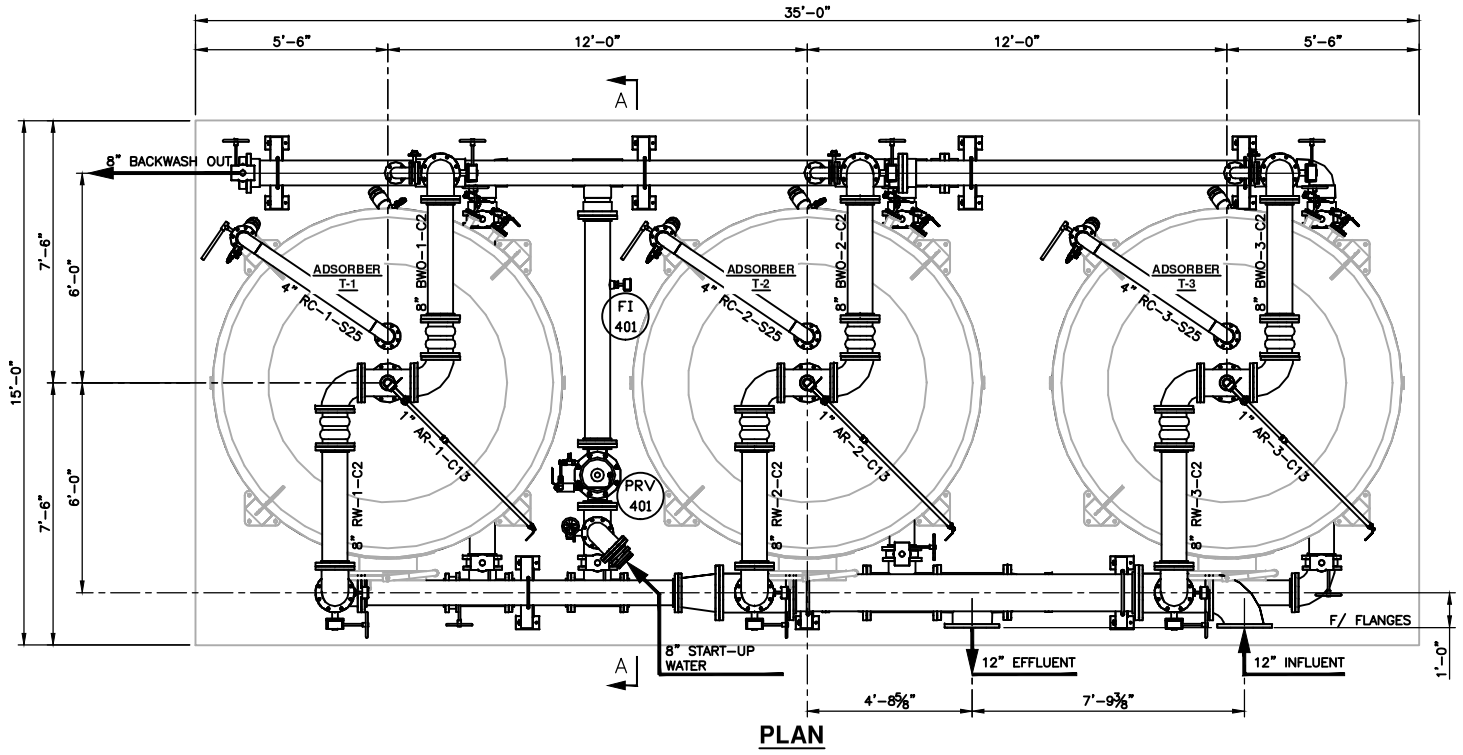

To
GAC
Influent
Grade
8'-10"

B

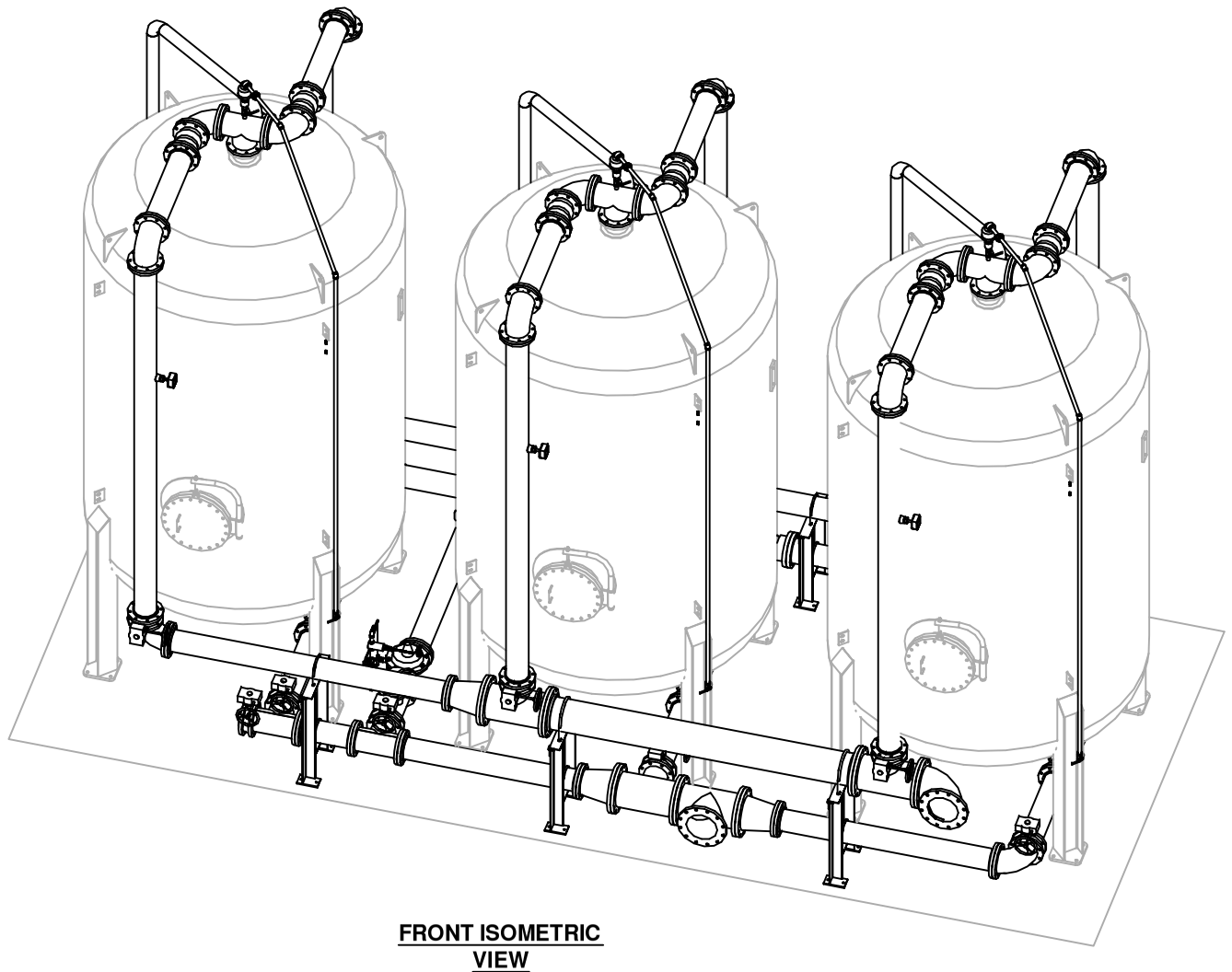

To
GAC
EFFLUENT
Grade
20"
Flange
5'-2"
℄
4'-8"
5'

Detail 2

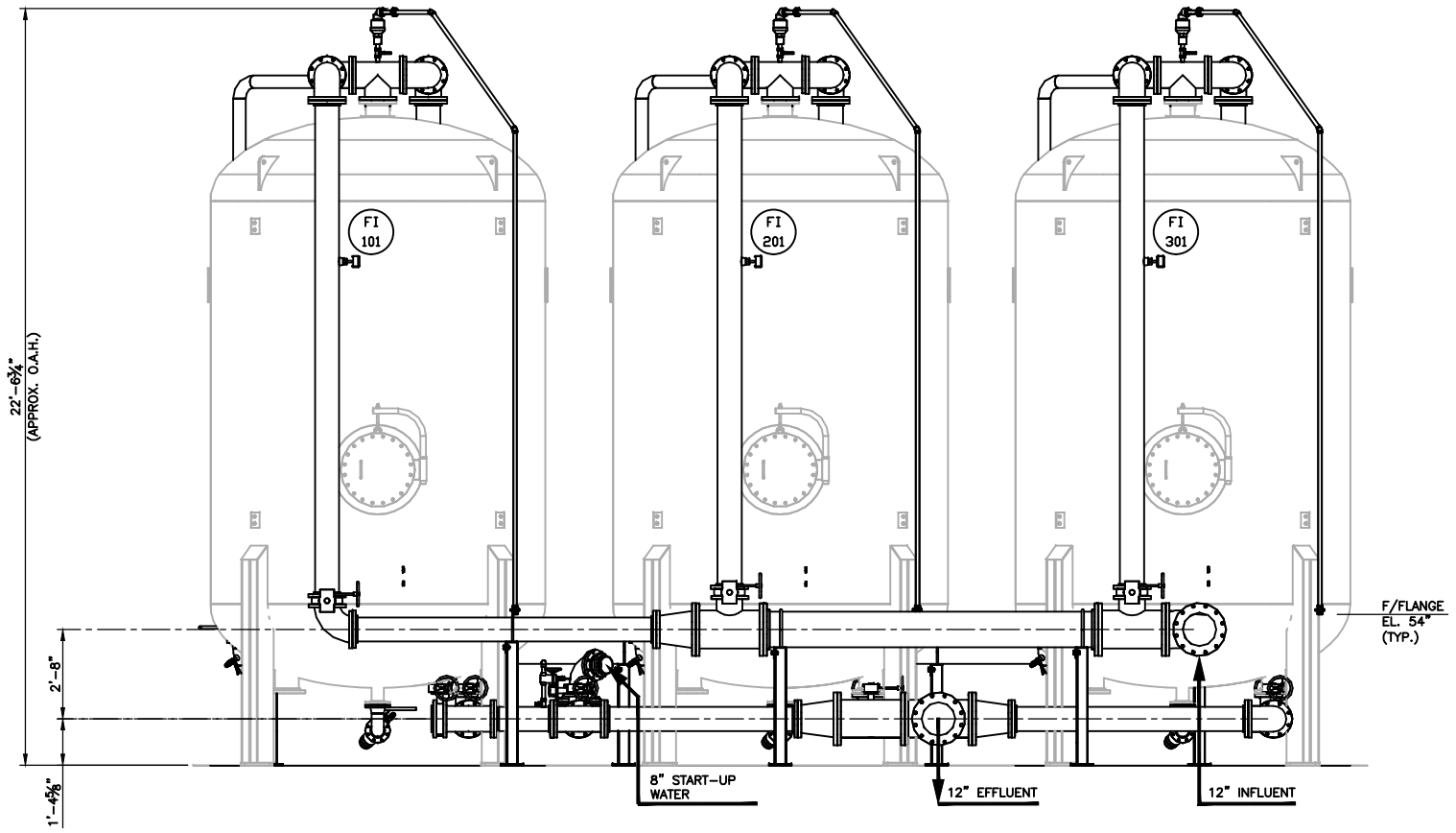

REVISED LAYOUT
THREADED ROD
(MAINS TO MANIFOLD)
12" DIP INFLUENT
12" DIP EFFLUENT
SP
SP
FLOWMETER
8" IN
8" BACKWA
8" EFFLUENT
SP
8" PVC B/W IN
PIPE SUPI
ELEVATION C-C
ELEVATION - LOOKING WEST
(PARTIAL)
1
2



PLAN



FRONT ISOMETRIC VIEW



FRONT ELEVATION

NOTES:
1. ALL PROCESS PIPING CONNECTIONS TO BE CLASS 150.

B	REISSUED FOR APPROVAL		2/17/12
A	WORKING		
REV	DESCRIPTION	APP	DATE

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30"	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

ESTIMATED WEIGHTS
VESSEL (EMPTY): 16,500 LBS.
VESSEL (OPERATING): 106,800 LBS

	NAME	DATE
DRAFTER	JFS	1/14/12
DESIGNER		
CHECKER		
APPROVAL		
PROJECT No.	LM-12024.AQNY	

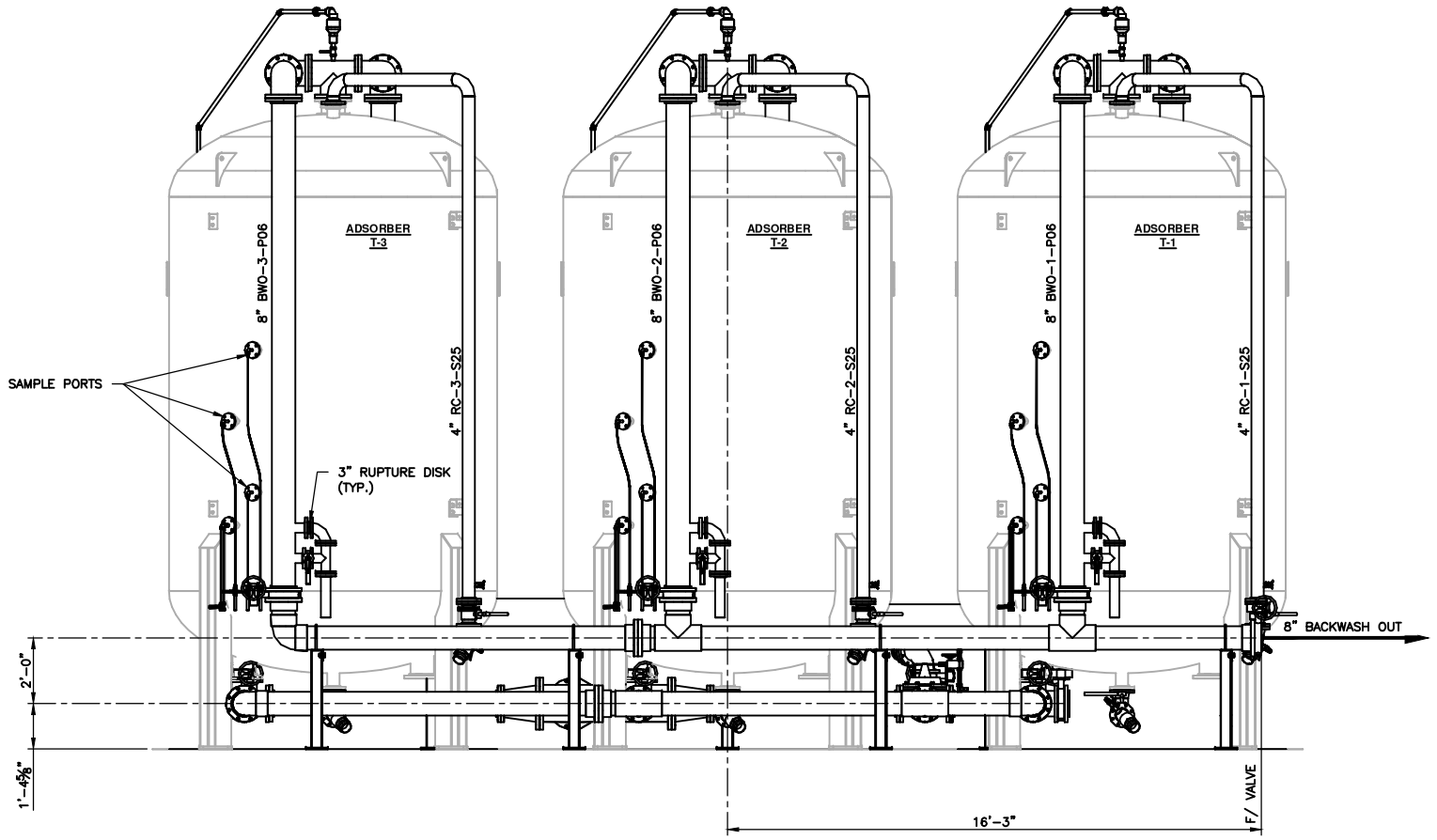
CalgonCarbon

CLIENT: AGVIQ, LLC
NASSAU COUNTY, NY

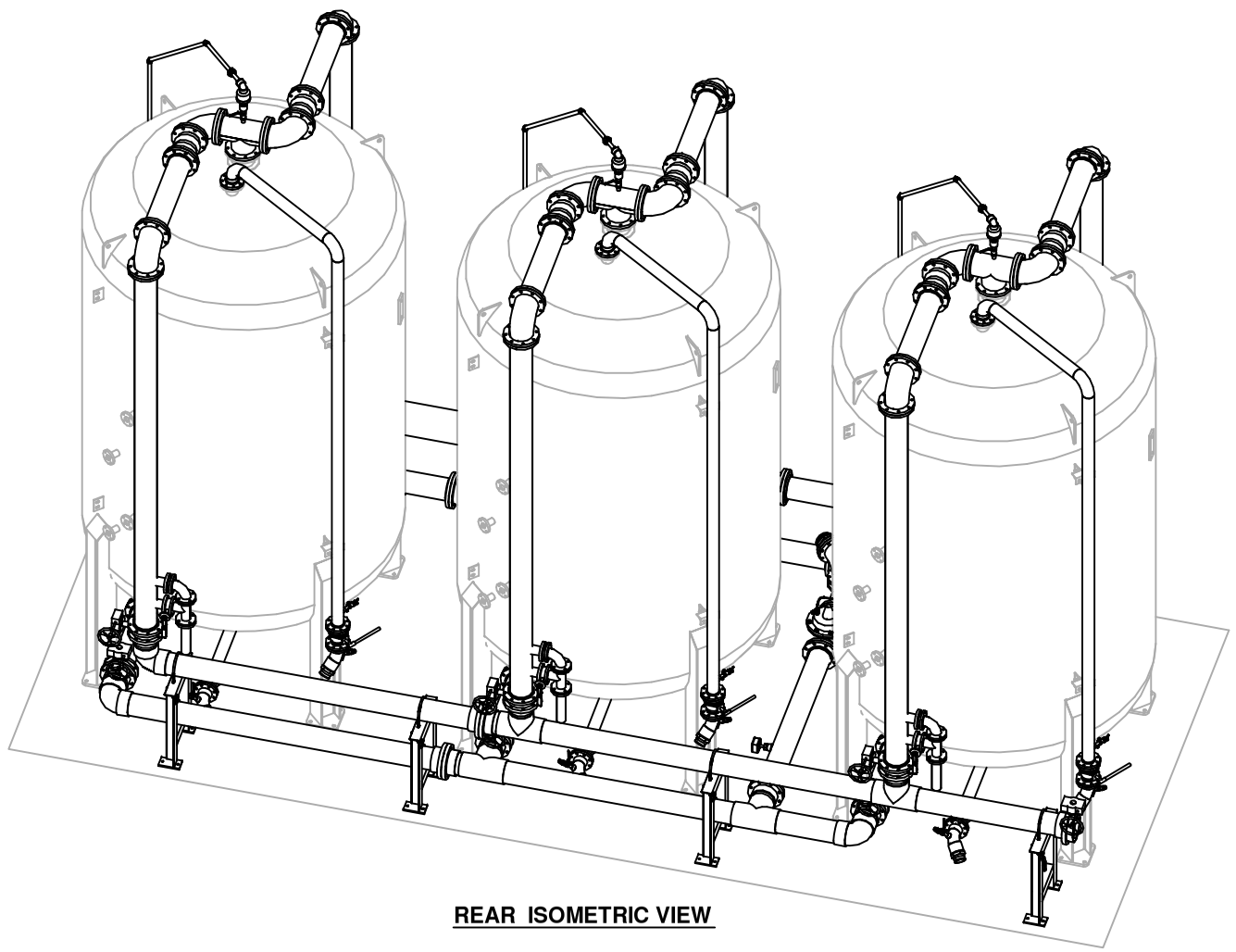
TITLE: CARBON ADSORBER SYSTEM
(3) MODEL 10 VESSELS
GENERAL ARRANGEMENT

DWG. Size: D | SHEET No.: 1 OF 2 | SCALE: NONE

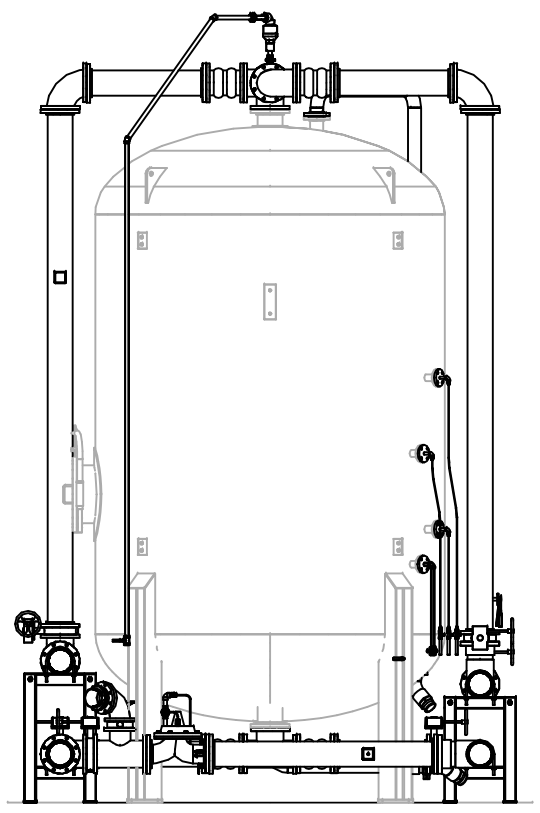
DWG. No.: 91126635 | REV.: B



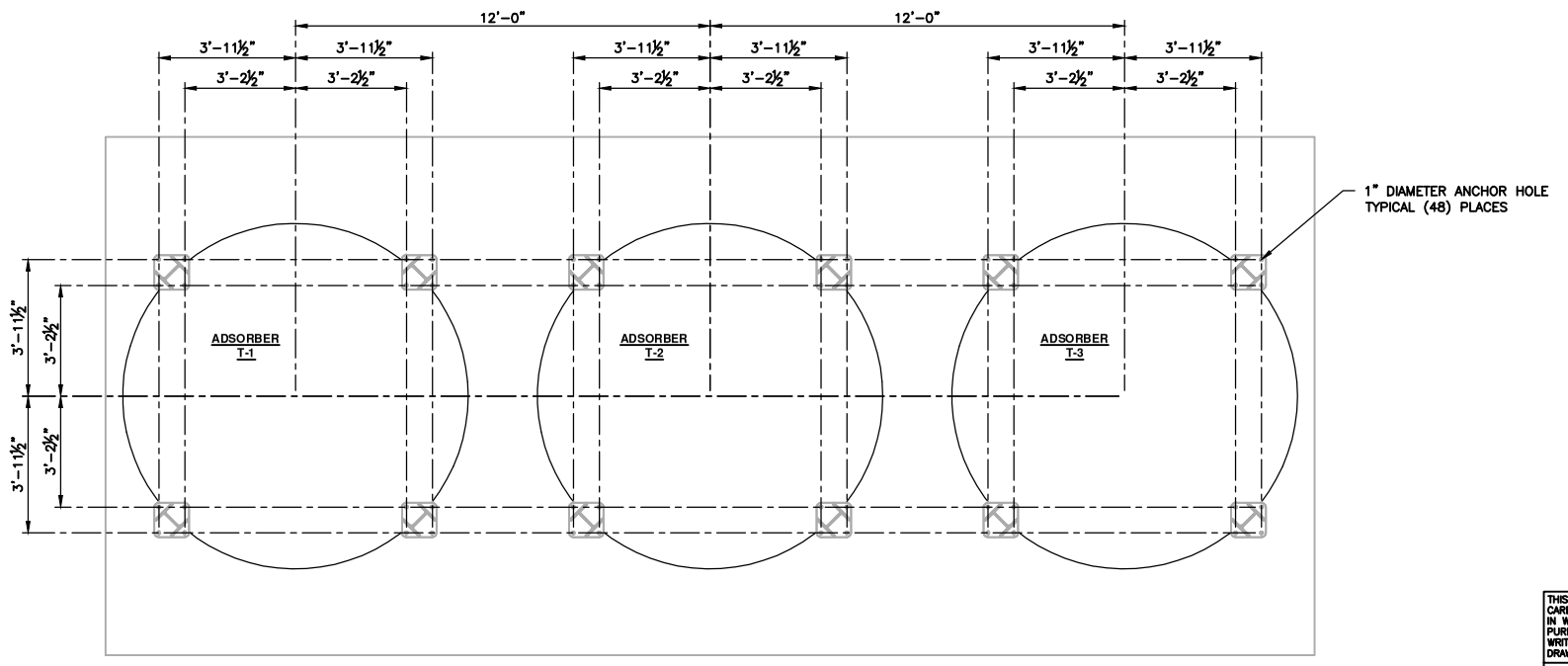
BACK ELEVATION



REAR ISOMETRIC VIEW



SECTION A-A
SHEET 1



ANCHOR BOLT PLAN

	NAME	DATE
DRAFTER	JFS	1/14/12
DESIGNER		
CHECKER		
APPROVAL		
PROJECT No.	LM-12024.AQNY	

REV	DESCRIPTION	APP	DATE
B	REISSUED FOR APPROVAL		2/17/12
A	WORKING		

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30'	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

CalgonCarbon

CLIENT: AGVIQ, LLC
NASSAU COUNTY, NY

TITLE: CARBON ADSORBER SYSTEM
(3) MODEL 10 VESSELS
GENERAL ARRANGEMENT

DWG. Size	SHEET No.	SCALE
D	2 OF 2	NONE

DWG. No. 91126635 REV. B

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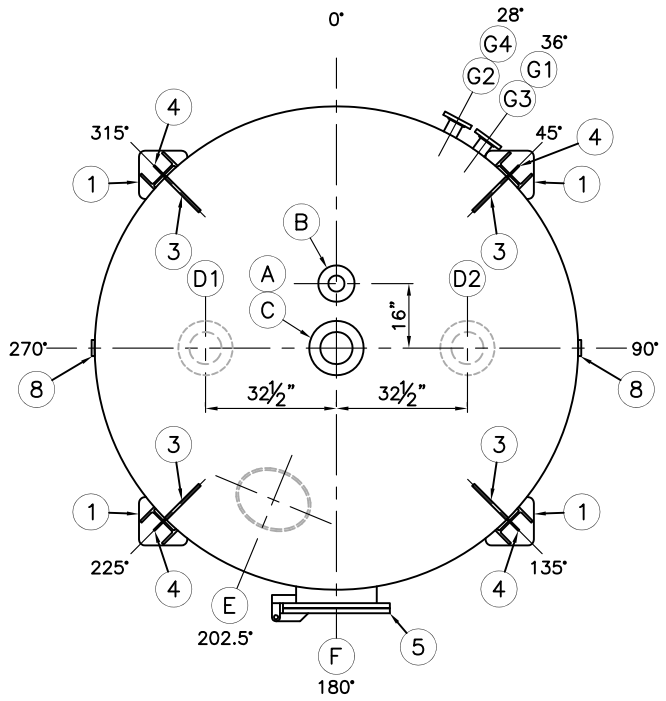
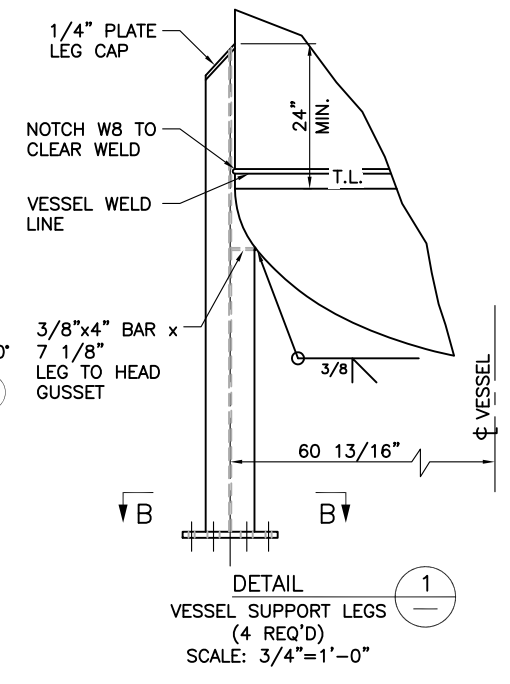
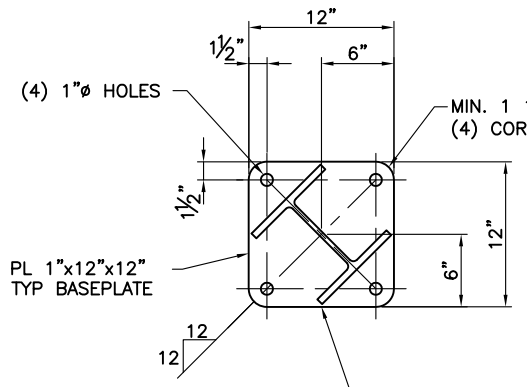


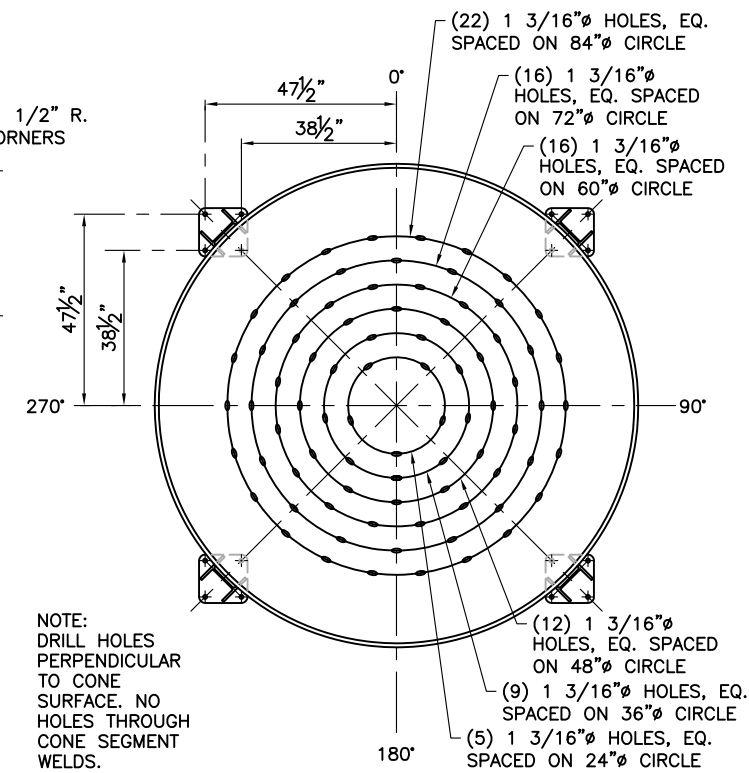
PLAN



DETAIL 1
VESSEL SUPPORT LEGS
(4 REQ'D)
SCALE: 3/4"=1'-0"

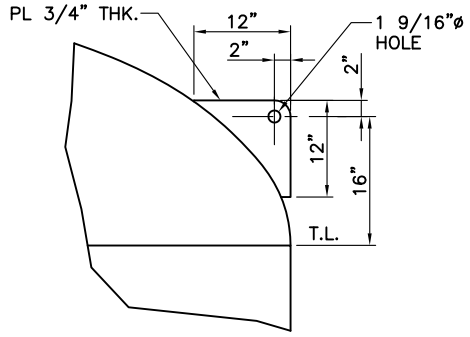


SECTION B-B
SCALE: 1 1/2"=1'-0"

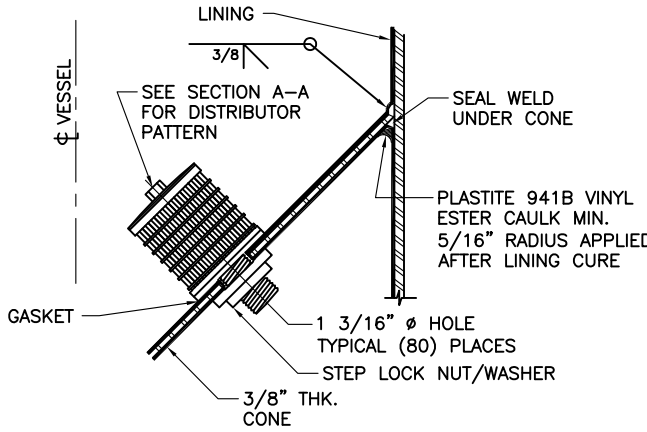


NOTE:
DRILL HOLES PERPENDICULAR TO CONE SURFACE. NO HOLES THROUGH CONE SEGMENT WELDS.

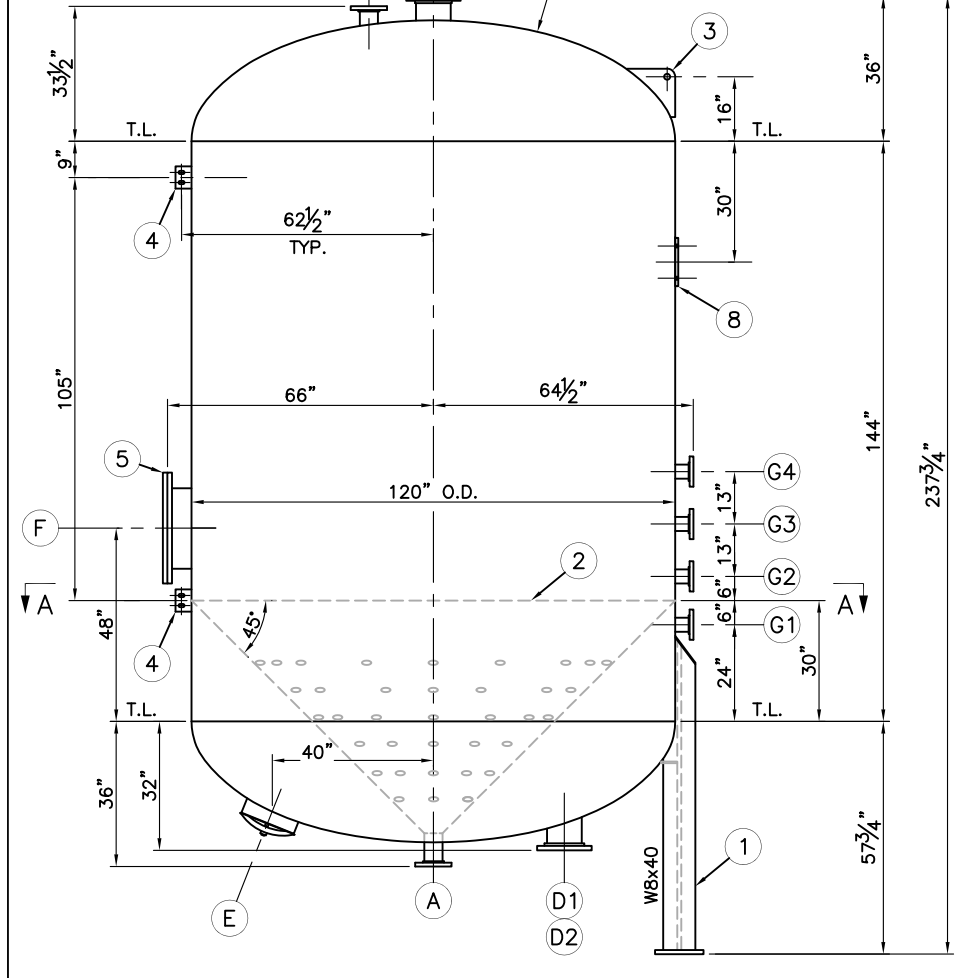
SECTION A-A



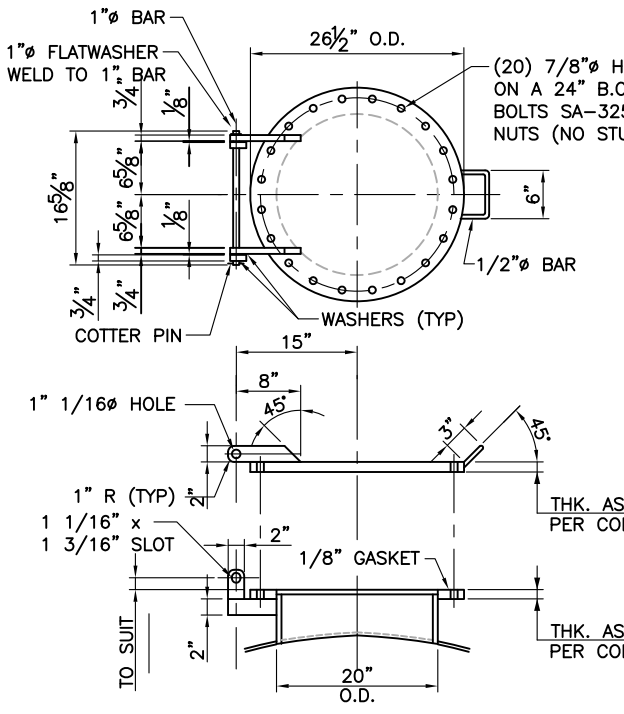
DETAIL 3
LIFTING LUGS
(4 REQ'D)
SCALE: 1"=1'-0"



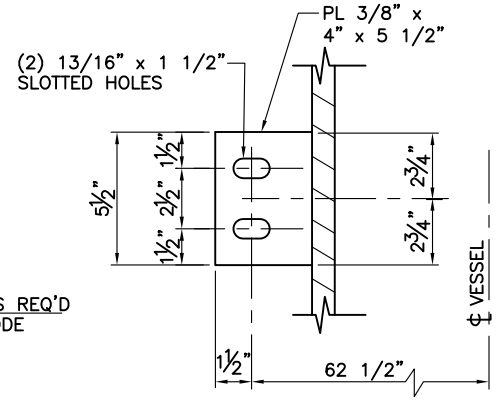
DETAIL 2
SCALE: 3"=1'-0"



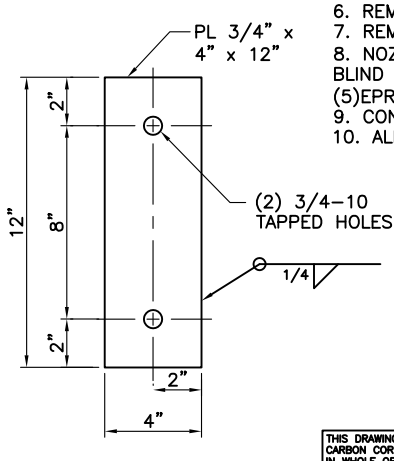
ELEVATION



DETAIL 5
20" MANWAY
SCALE: 1"=1'-0"



DETAIL 4
PIPE SUPPORT CLIPS
(8 REQ'D)
[30" ABOVE BOT. T.L., 9" BELOW TOP T.L.]
AT 45°, 135°, 225° AND 315°
SCALE: 3"=1'-0"



DETAIL 8
PIPE SUPPORT
(2 REQ'D)
SCALE: 3"=1'-0"

VESSEL DESCRIPTION	ADSORBER T-1, T-2 & T-3	
REFERENCES	VESSEL SPECIFICATION 7209A-VS1	
DESIGN CONDITIONS	125 PSIG @ 140° F	
OPERATING CONDITIONS	100 PSIG @ 100° F	
WALL THICKNESS	PER CODE REQUIREMENTS	
MATERIALS OF CONSTRUCTION	SHELL	SA-516-70
	TOP HEAD	SA-516-70
	BOT. HEAD	SA-516-70
	NOZZLES	SA-106 GR. B
	FLANGES	SA-105 (O.N.O.)
	LINING ABOVE CONE	PLASITE 4110 35-45 MIL NOMINAL DFT PIN HOLE FREE FOR IMMERSION SERVICE
	LINING BELOW CONE	PLASITE 4110 10-15 MIL NOMINAL DFT
	SEALANT	PLASITE 941B VINYLESTER CAULK
	SUPPORTS	A-992
	BOLTING	SA-325-1 WITH HEAVY HEX NUT - SEE NOTE 4
	GASKETS	1/8" EPR (45-55 DUROMETER) [1/4"TK. ELLIP]
TYPE CONSTRUCTION	FUSION WELDED	
CORROS. ALLOW.	NONE	
CODE	ASME SECTION VIII, DIVISION 1, 2001 ED., 2002 ADDENDUM	
INSPECTION	BY CALGON & CODE AGENCY	
STAMPING	ASME "U", NBR	
TESTING	HYDROSTATIC PER CODE	
STRESS RELIEF	PER CODE	
RADIOGRAPH	PER CODE AND CALGON CALCULATIONS	
NAMEPLATE	ASME	
STENCILS	LINED TANK: DO NOT WELD OR BURN	
SEISMIC LOAD	ZONE 4 I=1.0	
INSULATION	NONE - SEE NOTE 9	
SURFACE PREP	BRUSH BLAST PER SSPC-SPC7	
PAINTING	5-7 MILS DFT, CARBOLINE EPOXY 890 COLOR: #0908 (O'BRIEN SAND)	
LOCATION		
CAPACITIES	FULL 9,020 GAL.	
	OPERATING 9,020 GAL.	AT 100 % FILL
	MEDIA 20,000 LBS.	(750 CU.FT.)
PRODUCT S. G.	GR. 1.2	
WEIGHTS	EMPTY 16,500 LBS.	
	FULL H_2O 91,800 LBS.	
	FULL PRODUCT 36,500 LBS.	
	OPERATING 106,800 LBS.	

NOZZLE SCHEDULE

MARK	REQ'D	SIZE	DRILLING	FACING	DESCRIPTION
G	4	2"	150#	F.F.	SAMPLE POINT & VENT- SEE NOTE 8
F	1	20"		F.F.	MANWAY (BLIND GSKT.)
E	1	14"x18"	ELLIP.	F.F.	MANWAY WITH 1/4" TK. GASKET
D	2	8"	150#	F.F.	EFFLUENT - SEE NOTE 8
C	1	8"	150#	F.F.	INFLUENT
B	1	4"	150#	F.F.	CARBON INLET/VENT
A	1	4"	150#	F.F.	CARBON OUTLET SCH. 160 PIPE

NOTES:
1. ALL INTERIOR WELDS & EDGES TO BE GROUND TO 1/8" MIN.
2. ALL NOZZLES MUST BE FLUSH ON INSIDE OF SHELL, U.O.N
3. DETAIL 2, SECTION A-A, FIELD INSTALLED.
4. ALL NUTS & BOLTS TO BE ZINC PLATED.
5. 20" MANWAY FLG. TO BE SECURED WITH (2) BOLTS. REMAINDER OF BOLTS & NUTS TO BE PACKAGED AND SHIPPED IN THE CRATE.
6. REMOVE ALL WATER & DIRT AFTER HYDRO.
7. REMOVE ALL WELD SPATTER.
8. NOZZ. G2, G3, G4 & (1) NOZZ. D TO INCLUDE ASTM A105 150 LB. BLIND FLANGE, BOLTS, NUTS AND BLIND FLANGE GASKET INSTALLED,TOTAL (5)EPR BLIND GASKETS REQ'D INCLUDING MANWAY GASKET
9. CONTACT CCC FOR HEAT TRACE REQUIREMENTS.
10. ALL FLANGE BOLT HOLES TO STRADDLE CENTERLINES.

REV	DESCRIPTION	APP	DATE
A	ISSUED FOR APPROVAL		

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30'	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

	NAME	DATE
DRAFTER	JFS	1/13/12
DESIGNER		
CHECKER		
APPROVAL		
PROJECT No.	LM-12024.AQNY	

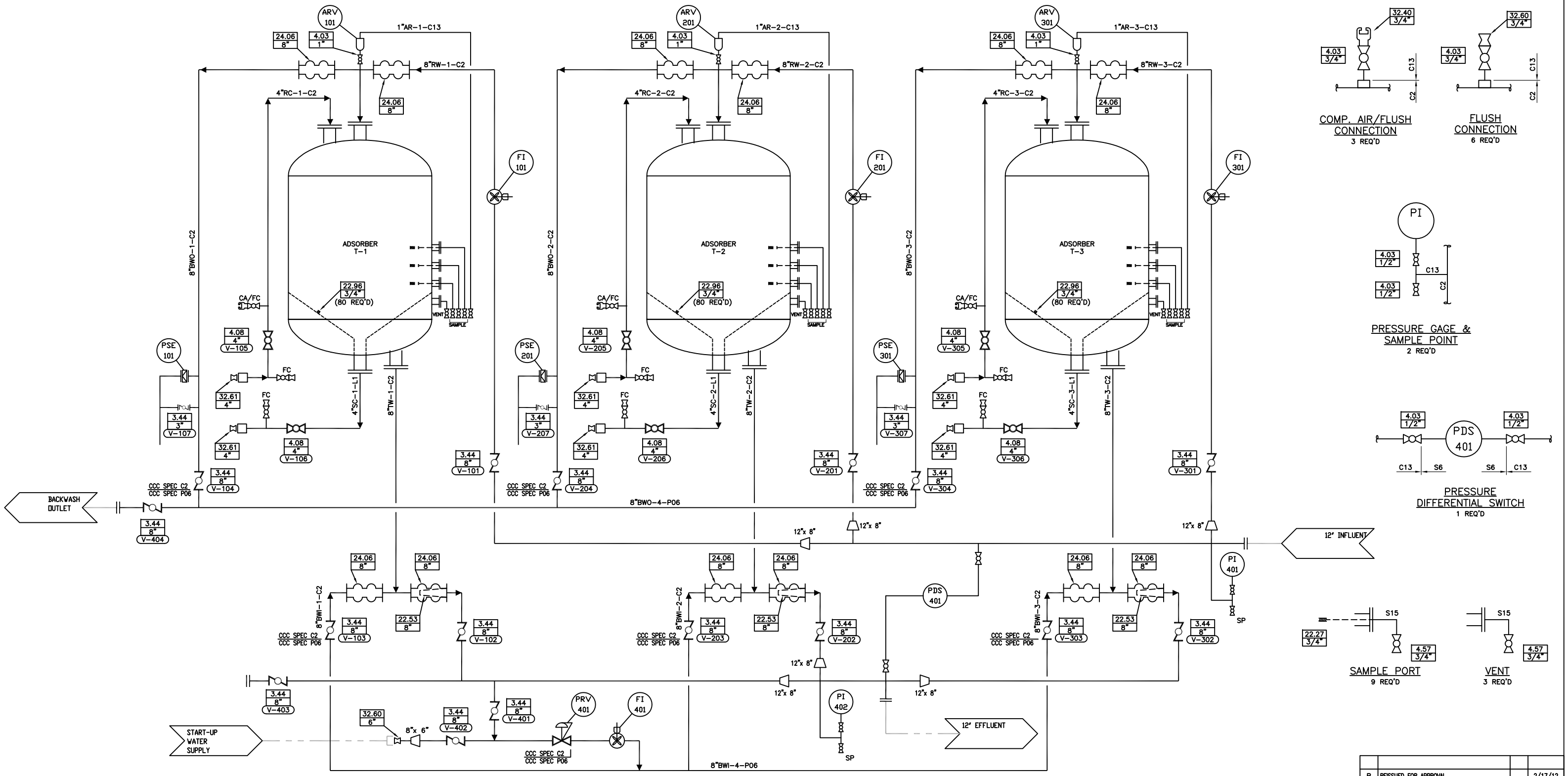
CalgonCarbon

CLIENT: AGVIQ, LLC NASSAU COUNTY, NY

TITLE: CARBON ADSORBER SYSTEM 10' DIA., 125 PSIG VESSEL ARRANGEMENT

DWG. Size	SHEET No.	SCALE
D	1 OF 1	NONE

DWG. No. 91126634 REV. A



MEDIA	INSTRUMENTATION	DESIGN CONDITIONS	LEGEND	ADSORBERS	UTILITY REQUIREMENTS
MEDIA: F300 AR QUANTITY PER VESSEL: 20,000 LBS. SERVICE: POTABLE	PRESSURE GAGE – WIKA 233.34 PRESSURE DIFF. SWITCH – ASHCROFT 1131 FLOWMETER – SEAMETRIX TX-100 FLOW INDICATOR – SEAMETRIX FT415 PRESSURE RED. VALVE – CLA VAL 694-01 AIR RELEASE VALVE – BERMAD AR SERIES	FLOW RATE – 1000 GPM (SERIES) 1400 GPM (PARALLEL) INFLUENT PRESSURE – 100 PSIG MAX. INFLUENT TEMP. – 120°F MAX. BACKWASH RATE – 1000 GPM MAX.	BW – BACKWASH WATER FC – FLUSH CONNECTION RC – REACT.(OR VIRGIN) CARBON RW – RAW WATER SC – SPENT CARBON SLURRY SP – SAMPLE PORT TW – TREATED WATER V – VENT	10'–0" O.D. x 12'–0" S.S. ASME 2:1 ELLIPTICAL TOP AND BOTTOM HEADS. CARBON STEEL CONSTRUCTION. ASME SECT. VIII, DIV. 1 W/ PLASITE 4110 LINING 125 PSIG @ 140°F DESIGN.	AIR, CARBON TRANSFER – 100 SCFM @ 30 PSIG MIN. PLANT WATER – 100 GPM @ 30 PSIG MIN.

	NAME	DATE
DRAFTER	JFS	1/13/12
DESIGNER		
CHECKER		
APPROVAL		

REV	DESCRIPTION	APP	DATE
B	REISSUED FOR APPROVAL		2/17/12
A	ISSUED FOR APPROVAL		

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30'	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

CalgonCarbon

CLIENT: AGVIQ, LLC
NASSAU COUNTY, NY

TITLE: CARBON ADSORBER SYSTEM
(3) MODEL 10 VESSELS
P & ID

DWG. Size	SHEET No.	SCALE
D	1 OF 1	NONE

DWG. No. 91126633 REV. B

PROJECT No. LM–12024.AQNY

V:\2012\LM-12024.AQNY\Drawings\Process\91126633 Flow Diagram.dwg Feb 17, 2012 - 7:31am

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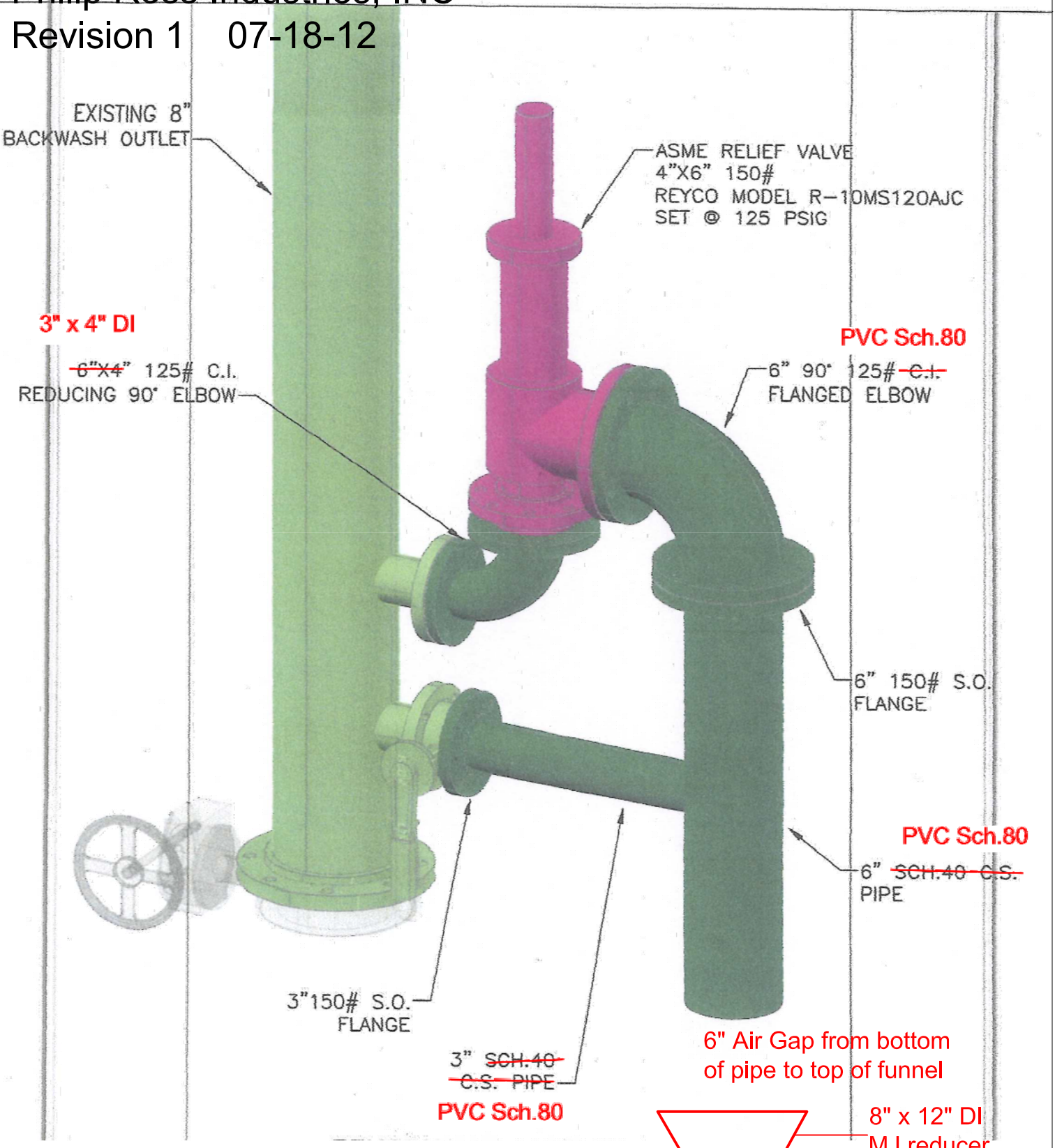
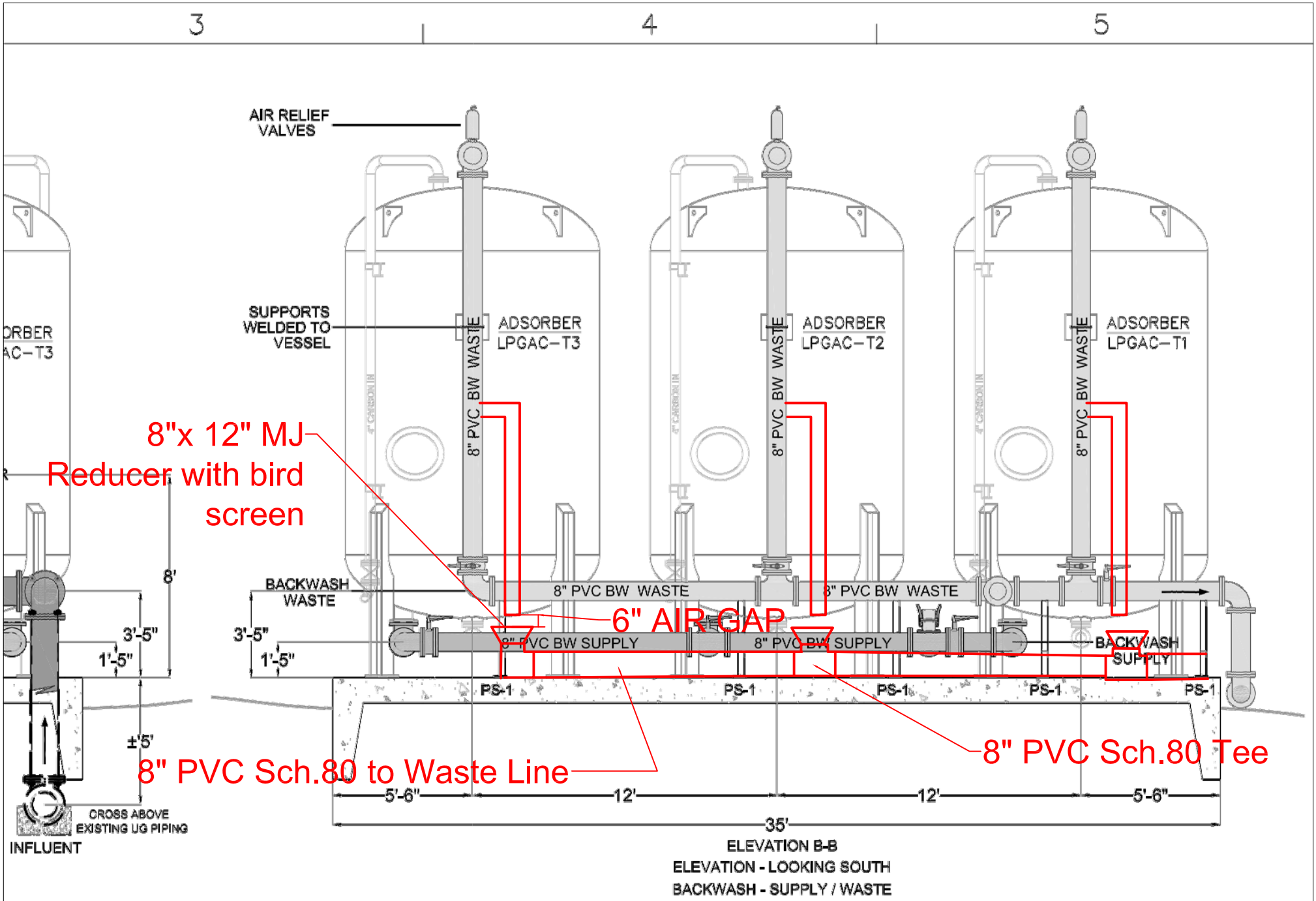
Revision 1 07-18-12





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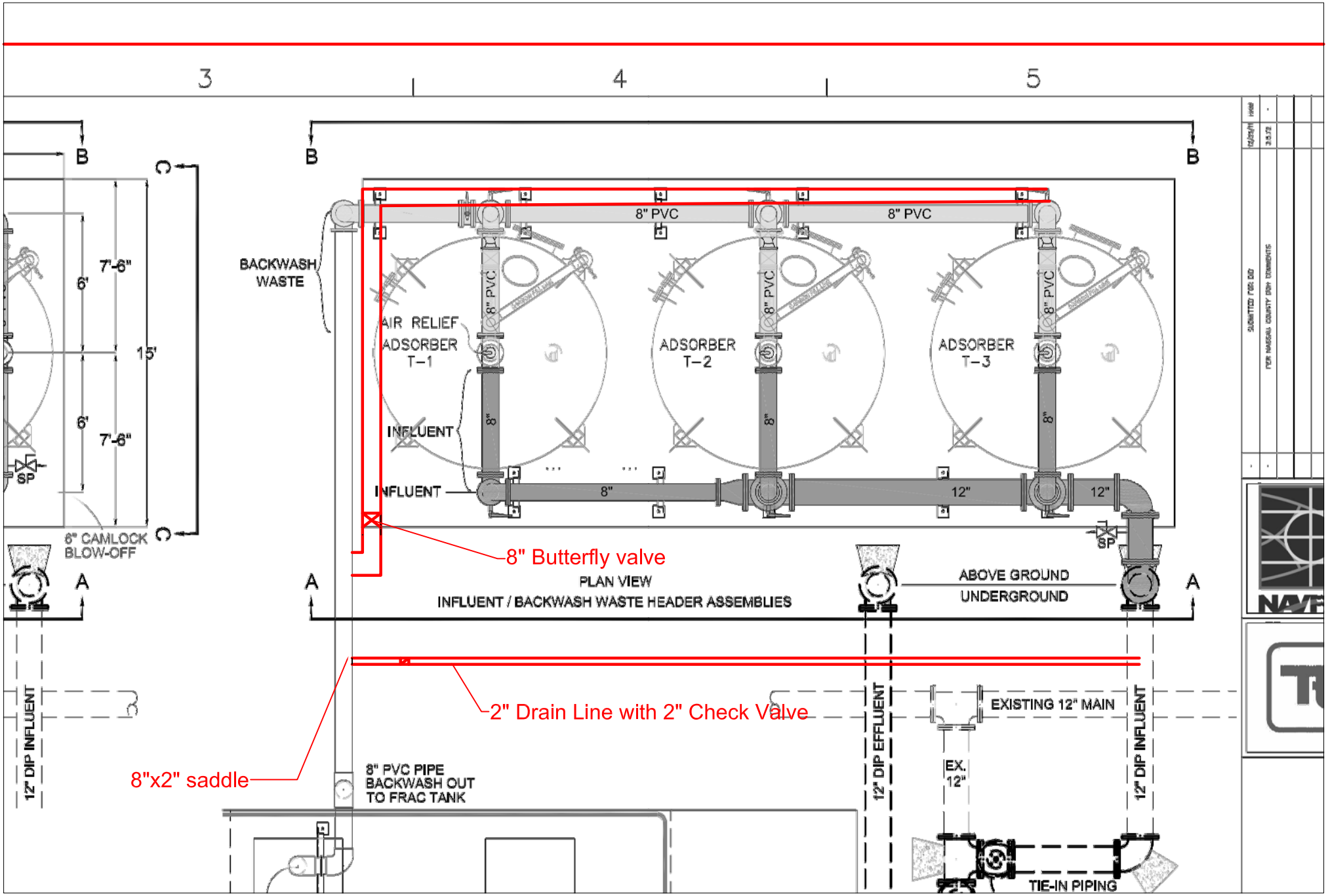

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